ROLE-PLAY AS AN INSTRUCTIONAL METHOD IN GRADE SEVEN SCIENCE CLASSES: A CASE STUDY

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BY

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Abstract

Role-Playing a S-T-S Issue
in Junior High Science:
A Case Study

A wide body of scholarly research reports that teachers consistently choose from a narrow repertoire of strategies in their teaching. This study attempted to broaden teacher repertoire directly, assessing teacher and student response to a new teaching method, role-play, while monitoring its implementation. Role-play was chosen as a suitable model because it is student-centered, has a history of educational use and is rarely encountered in science curricula. The investigation covered the full range of curriculum development, using a case study approach. A series of pilot studies in five classes over six months led to a curriculum package which was used in seventeen classes. This package consisted of a thirty-page role-play scenario with role briefs for student use plus guidelines and background for the teacher. The role-play concerns a town council debate over a proposed mine in an ecologically sensitive area. It requires two class periods. The material is suitable as a science-technology-society exercise for any secondary science class. Teachers attended a two-hour workshop about the teaching method. A total of fourteen teachers used the final package with four hundred and seventy-eight students. These classes were all at the Grade Seven level, in rural and urban schools. Students completed questionnaires before and after the role-play. The questionnaires assessed their attitudes to science and science teaching methods through Likert type and open-ended questions. Student responses to the Likert items were tabulated and examined for correlations with teacher responses. No significant differences were found among the classes. Student responses demonstrated clear and consistent attitudes about their science classes. This included a dislike of seatwork and teacher talk and a strong liking for field trips and laboratory work. Student responses on the open-ended questions were categorized. Representative comments were chosen to illustrate the range of student feelings about their science classes and their reactions to the role-play. The comments support the positions indicated by the Likert responses. In addition, they reveal deep student support for their active participation in the classroom. The role-plays were videotaped and analyzed using a rating scale. The rating scale had an interrater reliability of eighty-eight per cent. Teacher implementation of the role-play model, as might be expected for a first effort, varied over the wide range of twenty to eighty per cent. The study showed the feasibility of using role-playing classes in Junior High Science and the role-play's influence on affective learning of a large group of students. An important secondary finding was that teachers showed a wide range of implementation of the teaching technique. All teachers and ninety-six per cent of students expressed strong support of the exercise.

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Chapter 1
The Problem

1.1. Introduction

A wide body of scholarly research reports that teachers consistently choose from a narrow repertoire of strategies in their teaching (Aikenhead, 1987; Aikenhead, Fleming and Ryan, 1987; Connelly, Crocker and Kass, 1985; Samples and Hammond, 1985; Joyce, 1972). This study attempted to broaden teachers' repertoire directly and to assess teacher and student response to a new teaching method, role-play, while monitoring its implementation.

Role-play is a student-centered teaching method which involves students in imagining they are characters in a dilemma designed to bring out important concepts.

This thesis investigated in a largely qualitative manner the problem of determining the usefulness of role-play to the current science program. Usefulness is considered in terms of educational worth and student appeal as well as adaptability to the diverse needs of the classroom teacher.

The role-play developed for this study concerns a town meeting about an environmentally sensitive issue, the construction of a mine. Judgment of the technique was based on classroom observation, student and teacher response and rating scale score. Student response in the classroom and through questionnaires paralleled teacher comments in judging the method a useful and stimulating classroom exercise. The rating scale is a useful basis for discussion of the performance of role-playing.

1.2. Research Questions

1. Is role-play a useful teaching method for the current Grade Seven science curriculum?

2. How do Grade Seven science students respond to role-playing in the context of their expressed attitudes to science and other teaching methods?

3. What is the attitude of Junior High science teachers to role-playing in the context of their professional background and expressed attitudes to teaching science and to other teaching methods?

1.3. Purpose

This thesis investigates the implementation of a role-play from the viewpoint of expanding teacher repertoire. The study focuses on the current Junior High program in Newfoundland and Labrador, specifically Grade Seven science. Student attitudes to science and science class were surveyed by questionnaires. Teachers' professional characteristics were also surveyed by questionnaire. This information was used as a context for analysis of implementation of the teaching strategy. The actual role-play lessons were videotaped. The videotapes were used to construct detailed ratings on teacher and student fidelity to recommended role-play performance. Teachers were interviewed following the role-play to determine their reaction to the lesson and assessment of the class.

The thesis adds to the case study literature concerning the acquisition of teaching strategies and describes teacher and student reaction to one way of using role-play in science at the junior high level. The approach and materials serve as an introduction to a new strategy which may encourage teachers to broaden their repertoire.

1.4. Definitions

1.4.0.1. Case Study

Case studies, according to Hakim (1987, p. 60):

> take as their subject one or more selected examples of a social entity...such as events...that are studied using a variety of data collection techniques.

In contrast Walker (1986) defined the case study as:

> an example of an instance in action. The study of particular incidents and events, and the selective collection of information on biography, personality, intentions and values, allows the case study worker to capture and portray those elements of a situation that give it meaning. In educational evaluation or research the case study worker may attempt to study and portray the impact in a school of ...the experience of a curriculum development project team. (pp. 189-90)

1.4.0.2. Role-Play

Van Ments (1983, p. 16) describes role-play in these terms:

> The idea of role-play, in its simplest form, is that of asking someone to imagine that they are either themselves or another person in a particular situation. They are then asked to behave exactly as they feel that person would. As a result of doing this they, or the rest of the class, or both, will learn something about the person and/or situation.

1.4.0.3. Teacher Repertoire

As used by Joyce and Weil this refers to the range of techniques teachers may use in their teaching. Currently this repertoire is for most teachers restricted to recitation and worksheets, with laboratory work and all other techniques trailing. Although distinctions are sometimes drawn among teaching methods, instructional strategies and teaching strategies, no such separation is considered in this thesis; the terms are used interchangeably to refer to the means teachers use to achieve curricular objectives.

1.4.0.4. Attitude

> Borg and Gall (1982) distinguish attitudes by noting (p. 275):
> An attitude is usually thought of as having three components: an affective component, which consists of the individual's feelings about the attitude object; a cognitive component, which is the individual's beliefs or knowledge about the attitude object; and a behavioral component, which is the individual's predisposition to act toward the object in a particular way.

The questionnaires used in the thesis largely sample the affective component of student attitudes, while examining all three components of teachers' attitudes towards teaching methods.

1.5. Background to the Study

A variety of investigations have concluded that teachers may profit by broadening their teaching repertoire (Carlson, 1986; Dodd, 1985; Bybee, Carlson and McCormack, 1984; Shaftel and Shaftel, 1982; Joyce and Weil, 1980). Investigations of student cognitive styles indicate that a range of learning experiences are required if students are to benefit fully from instruction (Samples and Hammond, 1985).

The current Newfoundland science program recommends a minimum of oral instruction (Hopkins, Hayes and Janes, 1979, p. 12). It has a minimum of text and this is meant only to 'cement' activities and motivate students. There is a need for experiences that will encourage synthesis of concepts addressed in activities.

Current science teaching styles are largely restricted to lecture, recitation and laboratory demonstration (Gallagher, 1986; Connelly, Crocker and Kass, 1985; Brown and Butts, 1983).

The encouragement of diverse strategies is strongly recognized by the Newfoundland Department of Education (Philosophy and Objectives for Science Education, 1978, p. 10):

> Teachers should have at their command a wide variety of teaching styles. A teacher who can function only as a dispenser of knowledge is not competent to teach science.

Concern with teachers' repertoire is not restricted to teachers and educators. Students often voice concerns about a lack of variety in teaching styles (Baksh and Martin, 1986; Pope, 1984).

Very little study has been done of how and why teachers acquire new teaching strategies, or of students' reactions to particular methods. The area of instructional strategies has been identified as a research priority by the National Association of Research in Science Teaching in two surveys (Abraham, Renner, Grant and Westbrook, 1982; Butts, Capie, Fuller, May, Okey and Yeany, 1978).

Teacher repertoire may be viewed as a series of teaching strategies which exist to serve the instructional plans of the teacher. Joyce and Weil (1980) provide an overview of teaching strategies, including role-play.

Role-play has an extensive history of use by educators and a relatively large literature. This history and literature are largely concentrated in non-science areas (Livingstone, 1983; Furness, 1976; Maier, Solem and Maier, 1975; Towers, 1974; Corsini, Shaw and Blake, 1961). Nonetheless the work done suggests the possible usefulness of role-play to the science teacher. Examination of the reaction to the role-play by teachers and students can inform decisions concerning the adoption of role-play as a teaching strategy.

Teachers are not likely to encounter role-play as a teaching strategy in current curriculum materials. Role-play is not one of the learning strategies mentioned in the Teacher's Guide for Grade Seven science (Hopkins, Hayes and Janes, 1979). In fact, the only prescribed curricular use of role-play for the Newfoundland science curriculum occurs in the senior high school course on Environmental Science (Roy, 1983, p. 53). According to surveys of

teacher practices it is not widely used (Gallagher, 1986; Connelly, Crocker and Kass, 1985; Good and Brophy, 1978).

A prominent aim of science education is to affect student attitudes toward science and the environment. For instance, one goal of the current program is to "influence students to see that the environmental viewpoint must be considered in daily living" (Hopkins, Hayes and Janes, 1979, p. 13). Role-play is acknowledged as a valuable technique in shaping attitude by people who have investigated it (Van Ments, 1983; Shaftel and Shaftel, 1982; Joyce and Weil, 1980).

The lack of student power in the classroom has often been reported. Role-playing is one technique of teaching which places the students in central roles. Role-playing emphasizes student involvement, the teacher playing a relatively minor role in the context of the role-play (Van Ments, 1984). Students direct the course of the play. Joyce and Weil (1980) support the incorporation of role-playing because of its capacity to nurture student ability along four levels: 1.coping with change, 2. gaining insight into reasons for interpersonal behaviors, 3. skill in negotiation and self-expression and 4. tolerance of diversity.

Role-play is an appropriate expression of the current attempt to build a science-technology-society (S-T-S) strand into the science curriculum (Carlson, 1986). Questions relating to the nature of science, and how it affects society are central to this strand (Yager, 1988; Bybee, 1987; Bybee, 1986; Brown and Butts, 1983).

Instruction addressing the goal of understanding relationships among science, technology and society requires presentation of science issues related to students' technical and social world. It has been assumed that if teachers are aware of the nature of science this will be reflected in their teaching. Unfortunately, having a view of science does not mean that view

will be transmitted. Lederman and Zeidler (1987) found no important differences in classroom teaching between groups with high and low awareness of modern views of science. This suggests that expanding teacher awareness, though necessary, is not sufficient to cause desirable changes in science instruction. Role-play is an example of a teaching strategy appropriate to S-T-S because it is student-centered and non-authoritarian (Carlson, 1986).

Even among students who know basic science concepts there is little understanding of scientists as real people or how science fits in with everyday life (Fleming, 1987). Teaching strategies are needed which enhance understanding of concepts covered in school and allow students to see these concepts as useful in the world beyond school.

This is precisely the point that Abt (1970) made in promoting the use of 'serious games', which include role-play. He suggests that games are serious when they contain serious educational intent. They are advantageous because they offer an inexpensive way of enhancing student understanding, in a simulation of situations the students are likely to face in everyday life.

The teacher can assess the depth of student awareness of science topics by assessing the appropriateness of their use of science ideas in the role-play. It should be emphasized that this evaluative role is part of the teacher's agenda without being an integral part of the role-play as perceived by the students. The role-play is not intended to test students but exercise their abilities. However it is worth noting that many businesses do employ a form of role-play, the in-basket simulation, as part of their hiring evaluation (Cunningham, 1984). In this sense, exposure to simulations may be a valuable business-related skill for the student.

Briefly then, present teaching practice is narrower than desirable as judged by educational experts in the field and by students. Role-play is one alternative strategy that has been largely overlooked in the science curriculum.

Diverse groups have nonetheless adapted it to their needs. This case study attempts to adapt role-play to the goals of science education while documenting student and teacher reaction to role-playing as an instructional strategy.

1.6. Attitude Research

Haladyna and Shaughnessy (1982) estimated that about thirty studies a year report on attitudes toward science. They reported six broad categories in the literature. Current descriptions of attitudes included under this term cover a wide range:

- curiosity (Harty and Beall, 1984)
- attitude to scientists, attitude to science (Simpson and Oliver, 1985)
- emotional attitudes and intellectual attitudes (Moore and Sutman, 1970)

It is not surprising, therefore, that Gardner (1975) identified confounding of theoretical constructs as a major defect of attitude measurement research. This is despite the fact that instruments have existed since 1924, and the fact that formal education continues to emphasize the development of scientific attitudes (Billeh and Zachariades, 1975).

Given the confusion in the literature about attitudes, some arbitrariness of definition is unavoidable. The concern of this research is with attitude measurement as a guide to the evaluation of teaching methods. There are at least three sub-constructs involved: attitude to science, attitude to science instruction and attitude to school.

Attitude toward science instruction may be construed as the positive or negative feelings people have toward methods of teaching science (Haladyna and Shaughnessy, 1982). These methods would include the separate constructs of lecture, demonstration, discussion and others.

No instruments were found which concerned attitudes to specific teaching methods. This necessitated the building and testing of a new questionnaire. Parallel questions concerning students' attitudes to school were also constructed.

Attitude toward science is the student's attitude to science as a subject, his or her interest in and valuing of science. There are many instruments designed to measure some aspect of student attitude to science (Rideng and Schibeci, 1984; Lawrenz, 1984; Blankenship and Moore, 1977). This study explores what may be termed student comfort with and interest in science. A modified and shortened form based on Shaw and Wright (1967) and Wright (1982) was used for this purpose.

One would not of course expect that a single exposure to role-play would make a large change in student attitudes toward science. Rather the goal was to measure students' attitudes and relate them to students' opinions of the role-play.

1.7. Case Study Research

This research is largely qualitative in nature. It includes several different sorts of evidence, from both students and teachers, to evaluate the use and usefulness of role-playing in science. The teaching method is taken to be an event, with sixteen episodes of student and teacher involvement forming the context of discussing that event. The teaching method is the focus of the data gathered. The specific curriculum package used considerably narrows the definition of the teaching method, as does the fact that the teachers had not typically used it before. They therefore did not have standards developed for dealing with this kind of teaching, which is very different from the norm.

Case study research has been characterized as "eclectic" (Atkinson and Delamont, 1986, p. 48). This description fits the present investigation which uses interviews, videotapes, Likert questionnaires and open-ended

questions to assess teacher and student reaction. Such a use of qualitative and quantitative data to triangulate the object of interest is an accepted technique of case study research (Hakim, 1987). There are a great many variables affecting teachers' use of any strategy. This study's use of a variety of information sources and an accompanying variety of settings reflects the breadth of the classroom experience.

Ideally the introduction of role-play should be studied over a sequence of teaching episodes. But before it is used as a long term strategy, it must first be shown to have desirable qualities, such as flexibility, ease of use and positive student outcomes. This study should indicate such benefits and point to possible limitations.

1.8. Limitations

The classes were selected on the basis of their teachers' volunteering to participate in the study. Therefore the teachers' reactions to the role-play may not typify those of the teaching population. However expansion of repertoire is at present largely a personal matter. The volunteers may well typify those teachers looking to broaden their teaching repertoire.

Clearly the teachers may have been influenced by the sort of classes they have. A general rapport with a class may well have determined the decision to use a teaching method, with an observer present, which effectively grants students a great deal of power in the classroom. This is certainly a legitimate educational decision; it may have narrowed the range of students participating in the classes. A mitigating factor is the wide latitude among teachers as to what constitutes acceptable behavior.

Even though the sampling was not random, the Avalon North sample included six of the twenty-one teachers in the Board who are teaching Grade Seven science. Thus twenty-nine per cent of that Board's eligible teachers took part in the project. Clearly there are many teachers and classes for whom the results will be representative.

The classes represent a restricted geographical range of the province, the Avalon Peninsula of the Island of Newfoundland. This area contains over one-half of the province's population. Approximately one-half of the teachers were with rural schools, the other half being located in the cities of Mt. Pearl and St. John's.

Teacher and student reactions are based on relatively brief exposure to one role-play. This restricts interpretations of the effect of role-play as a technique. However, the reactions of both students and teachers are examined in considerable detail, thus allowing understanding of the potential of the role-play and exploring the usefulness of the format adopted.

Chapter 2
Review of Literature

There are two major fields of literature related to this study. These are role-playing and teacher repertoire.

Role-playing has been widely used in counselling, business and education. It therefore has a large reference base. The research base, however, was described as "surprisingly narrow" by Boothe in 1979 and has expanded little since in terms of published literature. The majority of references to role-play in education are in the areas of social studies and language. As an instructional method in science it has been mainly proposed for environmental science.

Instructional repertoire is emerging as an important area of research. Reports on teacher thinking (Dodd, 1985; Larkin and Rainard, 1984; Shavelson, 1983), teaching strategies (Joyce and Weil, 1980) and student attitudes to teaching methods (Baksh and Martin, 1986) all suggest its importance. Studies of teachers in the United States and Canada show consistently that they use only a few teaching methods in the classroom (Gallagher, 1986; Miller, 1986; Connelly, Crocker and Kass, 1985; Mitman, Mergendoller, Packer and Marchman, 1984).

2.1. Role-play

Most writers who use role-play define it in relation to a broad array of techniques called simulations. Joyce and Weil (1980) consider role-play to be a social model of teaching while Boothe (1979) describes it as an educational system. These views are not necessarily contradictory.

Abt (1970, p. 9) calls role-play and other simulations serious games, in that:

> ...these games have an explicit and seriously thought-out educational purpose and are not intended to be played primarily for amusement. This does not mean that serious games are not, or should not be, entertaining...If an activity having good educational results can offer in addition, immediate emotional satisfaction to the participants, it is an ideal instructional method, motivating and rewarding learning as well as facilitating it.

Cunningham (1984) classified simulations according to their purpose. He groups role-play with gaming simulations, in terming them educational simulations. He distinguishes these from evaluative simulations such as in-basket simulations which are defined as "assessments of an individual's ability to respond to situations that would normally occur during the job" (p. 217). In contrast, Taylor (Cecchini and Frisenna, 1987) classified simulations on a single continuum of increasing abstraction, from in-basket simulations through role-play, to gaming simulations .

All authors consider educational use of role-play to involve the students in taking on roles, usually as someone else, according to loosely defined sketches rather than complete scripts. The enactments principally invoke the students' conceptions and attitudes of these roles rather than an authoritative picture.

There are many definitions of role-play, stemming in part from the different orientations of its users. It was originally defined in terms of psychological therapy by J. L. Moreno in 1934 (Biddle, 1979). Work in

counselling has continued to use role-play (Biever, 1981; Ebert, 1980; Maslin, 1979; Huyck, 1975). However, therapeutic use of the technique is distant from the present purpose and will not be a focus of this review.

Role-play has been adapted to business (Maier, Solem and Maier, 1975; Towers, 1974) and education (Taylor, 1983; Furness, 1976; Joyce, 1972; Shaftel, 1949).

Business use of the technique has stressed acquisition of skills, notably management skills (Maier, Solem and Maier, 1975; Towers, 1974; Abt, 1970; Corsini, Shaw and Blake, 1961). The explicit goal of this work has often been to train people for a situation. This may be a simple situation, for instance how to approach a customer (Boothe, 1979); or the situation may be complex, modeling the handling of an emergency oil spill (Marcus and Heaton, 1977). Other work has concentrated in the area of human relations (Maier, Solem and Maier, 1975; Towers, 1974; Corsini, Shaw and Blake, 1961).

Primary and secondary education has emphasized role-play for social studies applications (Milroy, 1982; Biddle, 1979; Furness, 1976; Shaftel, 1949). Some texts deal exclusively with role-play for language use (Livingstone, 1983). General educational texts of role-play do, however, mention mathematics and science as areas where role-play may be used (Van Ments, 1984; Milroy, 1982).

The educational literature on role-play will be examined in terms of definitions used and approach taken. Finally, specific applications of role-play to education will be summarized.

2.1.1. Defining Role-Play

> Biddle (1979, p. 190). defines role-play as a:
> basic strategy for learning. It appears spontaneously in the behavior of children and is formalized among adults as theatrical performance.

Shaftel and Shaftel (1982) define role-play as a procedure where persons in a group play specified roles in a simulated life situation, with the assumption that it will influence attitudes and behavior. The individuals may be asked to express ideas that are part of the roles but are not in accord with their own convictions. They view the central aspect of the role-play to be the dilemma - a problematic situation around which the enactment will be built.

Joyce and Weil (1980) adopt the model of role-play proposed by Shaftel and Shaftel. They suggest that students can use role-play for exploring human relations problems by enacting problem situations and then discussing the enactments. They describe two situations that may call for the use of role-play: to begin a systematic program of social education or to counsel a group of children to deal with an immediate human relations problem.

Boothe (1979) defines role-play as a learning method used for developing new behavior. He then expands on this, defining several types of role-play, specifying that didactic role-play for instance involves patterning, demonstration of correct procedure and capturing of the role-play for analysis and critique using a specific analysis model. He describes classroom teaching and student learning practices which cause teachers and students to interact and/or students to interact with each other as Interaction Methods of Instruction. These methods include case study, discussions, simulations and role-play, among others. He views didactic role-play as an instructional system.

In contrast, Van Ments (1983) classifies enactments (which include role-play), games and simulations as educational simulations. These are thought of as experiential techniques, since they:

> ... rely for their effect on the student's actual experience of emotions, feelings, communications, situations and other intangibles. (Van Ments, 1983, p. 151)

Role-play is a non-therapeutic enactment which may involve self or others and may be structured or exploratory. Van Ments (1983, p. 17) describes role-play as:

> ...asking someone to imagine that they are either themselves or another person in a particular situation. They are then asked to behave exactly as they feel that person would. As a result of doing this, they, or the rest of the class, or both, will learn something about the person and/or the situation. In essence, each player acts as part of the social environment of the others and provides a framework in which they can test out their repertoire of behaviors or study the interacting behavior of the group.

Van Ments further distinguishes role-play from acting. For the actor (Van Ments, 1983, p. 20):

> ...the objective is always the same: to move and influence the audience, to entertain and divert them.

In contrast, the role-player:

> ...is not concerned with the audience, only with himself and his fellow role-players... the 'acting out' in role-play is, for all practical purposes, no greater than that which is done by the majority of people from time to time in the course of their everyday lives. (Van Ments, 1983, p. 20)

2.1.2. Structure of the Role-Play

Almost all writers on role-play consider it to have three basic stages. First there is a briefing. This establishes the situation. Secondly, an enactment occurs in which the students simulate a dilemma or other situation. Thirdly, a structured follow-up takes place with discussion by the participants. Three approaches will be used to illustrate the range of views on role-play. Different terms are often used and the number of steps considered varies. Despite the shifts in terminology there exist broad similarities in the structure and function of the role-play.

For all teaching prior to the enactment Milroy uses one phase,

briefing; here the simulated situation is introduced. The roles are also determined and allocated at this stage. Taylor (1983) mentions three separate phases for these functions, namely: explanation of role-play, briefing sessions and role allocation. The briefing sessions give the context of the exercise; role allocation is recommended to be random. In Joyce and Weil's summary chart of Shaftel and Shaftel's role-play model four specific phases are recommended before enactment. These are warming up the group, selecting participants, setting the stage and preparing the observers. The warm-up identifies the problem and explains role-play. Preparing the observers instructs any non-role-players on what to look for and assigns observation tasks.

The enactment, or actual role-play, is treated more uniformly. Milroy calls it interaction. Interaction is the playing out of the simulated situation and is spontaneous. Taylor calls the enactment an operating session. The operating session stresses that there are established deadlines, but that the participants are largely in control. For Shaftel and Shaftel the actual role-play is an enactment. Enactment includes the beginning and breaking of the role-play. The role-play is said to be broken rather than ended because of the prospect of a later reenactment.

The stages after the enactment have different emphases for the three. Milroy simply mentions discussion. Discussion covers the decisions taken and their possible consequences. Taylor includes debriefing and a final teacher evaluation. The debriefing is important, among other reasons, for correcting discrepancies and for dissociating the players from their roles. Shaftel and Shaftel have a more elaborate system involving discussion and evaluation, then a reenactment followed by further discussion and evaluation, all concluded with sharing of experiences and generalization. The first discussion prepares for a reenactment. The generalization attempts to find general principles of behavior.

It is clear that the differences in approach are mainly variations on

an underlying method and share several important features. There is always an introduction, to set the stage for experienced students or to give a more thorough background for novices. All authors consider the teacher's role during the actual role-play to be minimal. Although the teacher is of course instrumental in designing or choosing the dilemma, the students are considered autonomous in their enactment. The teacher can always intervene, but this usually means the end of the role-play.

The end of the role-play itself does not end the lesson. The debriefing is considered important, in part because of the autonomy the students enjoyed during the enactment. Taylor's approach stresses the correction of misstatements arising in the enactment. The main purpose of the debriefing is to have the students reflect on the experience and abstract appropriate generalizations.

2.1.3. Educational Use of Role-Play

A number of educational texts describe role-play (Kourilsky and Quaranta, 1987; Orlich, Harder, Callahan, Kravas, Kovichak, Pendergrass and Keogh, 1985; Livingstone, 1983; Van Ments, 1983; Milroy, 1982; Shaftel and Shaftel, 1982; Joyce and Weil, 1980; Furness, 1976).

Within education, role-play use has been used for skill acquisition and social awareness . The former has involved language learning (Livingstone, 1983; Ladousse, 1982; Heyworth, 1978), problem-solving (Glenn, Gregg and Tipple, 1982), competency-based education (Boothe, 1979), and discovery learning (Dudley, 1980) as well as examinations (Jones, 1982; Boothe, 1979).

In the area of social awareness, role-play has been broadly recommended for elementary school (Furness, 1976), social studies (Shaftel and Shaftel, 1982; Joyce and Weil, 1980; Chesler and Fox, 1966) and values clarification (Simon, Howe and Kirschenbaum, 1972). With these authors the emphasis is on improving interpersonal skills. Furness, for instance, stresses

the communications and social studies aspects of role-play. She does mention using role-play for mathematics, language arts and social studies.

While several authors of general texts refer to the possibility of using role-play for science instruction (Shaftel and Shaftel, 1982; Furness, 1976), none fully explore the possibility. Most curricular mention of role-play in general texts refers to social studies applications while mentioning the range of possible applications (Kourilsky and Quaranta, 1987; Orlich, Harder, Callahan, Kravas, Kovichak, Pendergrass and Keogh, 1985; Van Ments, 1983; Milroy, 1982; Good and Brophy, 1978). Van Ments (1983, p. 29) asserts:

> The most obvious uses of role-play are in those areas which deal primarily with aspects of communication.

Isolated articles suggest the use of role-play in physics (Ponting, 1978), biology (Stamper, 1973) and chemistry (Metcalfe, Abbott, Bray, Exley and Wisnia , 1984). Ponting (1978) used a play about physicists to enhance analytical thinking in high school students. Metcalfe, Abbott, Bray, Exley and Wisnia (1984) had a class of ten and eleven year-old boys and girls role-play changes of state. A control group learned the same material in a traditional format (laboratory practical work). Although both groups attained the same achievement level in factual recall, the experimental group scored significantly higher in explanation and interpretation.

Use of role-play in science education is most often described for environmental science. This may be as part of large curricular packages (Hay, Watson and Pritchard, 1984; Taylor, 1983; Barile, 1982; Iozzi, 1982; Metro-Apex, 1974) which have role-play as a major emphasis or it may be as individual reports (McKay, 1988; Bybee, Hibbs and Johnson, 1984; Agricultural Land, 1983; Petersen and Tiffany, 1983; Byers, 1979; Maxey, 1979; Connally, 1978; Caistor, 1973; Stamper, 1973). The curricular projects simply prescribe role-play. They do not attempt to study it, although sophisticated rationales for its use are sometimes included, as in Taylor.

The small reports tend to posit the usefulness of role-play in an anecdotal manner. They support Walford's (1985) assertion of the general field that it has been taken more on trust than research. A sampling of these will show their general approach. There is usually no detailed analysis of response by teachers or students; the authors simply report their overall impression. Connally reported the use of a role-play game to teach web roles to approximately 100 seventh graders with 'excellent' results. Byers (1979) reported on a role-play game to teach environmental decision-making. The exercise was used 'effectively' with his class of thirty tenth grade students. Caistor (1973) devised, with others, a role-play exercise about town development and water resources for use with students aged sixteen and seventeen. This exercise took two periods, with both pupils and staff feeling it was 'very successful'.

Many of the smaller reports are essentially lesson plans for the use of role-play. Here no mention of classroom reaction is given. These include Maxey's (1979) role-play on a nuclear power plant, the Illinois State Board of Education's role-play 'Agricultural Land' (1983) and Bialosiewicz and Burns' (1983) game of childhood diseases. Bybee, Hibbs and Johnson (1984) wrote a role-play on the acid rain debate[1] . It provides a detailed sketch for holding a hearing of an international commission on the acid rain problem. The authors feel it will teach the students the causes and effects of acid rain, and allow them to formulate several concrete solutions.

There has been almost no exploration of the usefulness of role-plays to high school teachers or students. There has been no research on why teachers might adopt role-play as a new teaching strategy, although several studies have compared the effectiveness of various forms of role-play to other teaching methods (Kern, 1984; Shapiro, 1978).

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[1]This was used as a model for the Gold Role-Play (Appendix A).

2.2. Teacher Repertoire

Numerous studies have been conducted which detail and decry the narrowness of teaching methods in the classroom. Wagganer (1985) found an "overwhelming" use of teacher lecture and classroom discussion in a survey of elementary schools in Missouri. Mitman, Mergendoller, Packer and Marchman (1984) studied eleven teachers over a full school year in California and Utah. They found that worksheets and to a lesser extent laboratory activities were the most common type of teaching activity. The authors note:

> ...most students in our study probably passed through a year long life science course without ever having to write as much as one paragraph of original information or interpretation. (p. 263)

Recitation was the predominant mode of instruction, taking up 31 per cent of the class time, followed by seatwork with 21 per cent.

Gallagher (1986) studied thirty-three teachers over an eighteen month period. He reported variation in teaching techniques used, but only a small range of activities for any one teacher. Moreover, the teaching strategies used concentrated on lower order cognitive skills, and textbooks appeared to be the main source of content. It is interesting to note how these teachers considered themselves:

> Most teachers perceived they were effective... They also appeared to believe that they could learn little about teaching from one another, from administrators, or from outsiders such as University professors...we were never asked about how to teach ... nor did we ever observe teachers asking each other about teaching strategies. (p. 8)

Large national studies in the United States and Canada have confirmed the finding that teachers tend to use only a few teaching methods. Connelly, Crocker and Kass (1985) reported on a national survey of Canadian secondary science that teachers rarely go beyond lecture, discussion and laboratory work. A previous Canadian study reported by Olson and Russell (1984) and American studies by Miller (1986) and Goodlad (1984) have drawn similar conclusions.

The findings confirm a need that has been addressed by several authors. Fox and Lippitt concluded in 1967 that teachers needed more information about materials and practices.

Joyce and Weil (1980) describe the building of teacher repertoire in terms of teaching models. They view role-playing as an important ingredient in the mix of skills teachers should command. Showers, Joyce and Bennett (1987) argue for staff development built in part around 'models of teaching or instructional strategies'. They stress strategies which research has shown to support increased student learning and aptitude to learn.

The National Association for Research in Science Teaching has done two studies which suggest the awareness of instructional strategies as an important area. Butts, Capie, Fuller, May, Okey and Yeany (1978) report on a Delphi study of nearly a third of the Association's membership (248 people). 'Identification and validation of instructional strategies' was among the top ten ranking concerns of respondents. Abraham, Renner, Grant and Westbrook (1982) in a later survey of the Association's members found instructional strategies had received the highest average priority across all categories of areas needing research.

Shavelson (1983) suggested that we should build on our descriptive base of teacher thinking while improving educational practice.

These reports, taken together, support the investigation of new teaching strategies. One other source of such support is often neglected: the students who experience them.

There has been little attention in this province or elsewhere to the concerns of students as to how they are taught. Baksh and Martin (1986) surveyed secondary students in the Atlantic Provinces of Canada. They found narrowness of approach to teaching a prime concern of students. These students emphasize the importance of doing things rather than listening to teachers talk.

Pope (1984) surveyed Newfoundland dropouts on their reasons for leaving school. A prominent reason is student boredom . Hatred of school peaks in the junior high grades; a sizeable proportion of students give 'not liking subjects' as a reason for leaving school.

Mitman, Mergendoller, Packer and Marchman (1984, p. 259) reported that:

> ...students gave higher ratings of interest, thought and attention to class periods where they had been engaged in resource activities.

Thus students, as well as educators, are interested in a broadening of the teaching strategies used in the classroom.

Chapter 3
Design of the Study

This study systematically investigated the reactions of teachers and students to role-play as a science teaching model, using a role-playing scenario designed for this purpose (Appendix A). This scenario was part of a curriculum package developed through a series of pilot studies. The role play provides a simulation of a town council meeting. A series of roles were written to supply some essential information to the players, while leaving room for additional student input.

Teacher preparation involved a workshop with the volunteer teachers which explored the use of role-playing as a teaching method in science class.

Implementation by each teacher involved introduction of the role-play and videotaping the performance of the role-play.

Students completed two questionnaires. Teachers completed a questionnaire before observation and responded to a brief series of questions afterwards.

3.1. Description of the Study

3.1.1. Pilot Study and Development of the Package

The background literature of role-playing was surveyed in the summer of 1987. The role-play itself was loosely patterned after a role-play reported by Bybee, Hibbs and Johnson (1984). Its format follows that suggested by Cryer (1981).

The package, including questionnaires and role-play, was ready in the fall of that year. A series of studies were used to pilot the package.

Pilot study involved extensive testing of the curriculum package with four groups of university classes and one Grade Seven class over the fall and spring of 1987-1988.

In the fall two advanced undergraduate science methods classes (having twenty and fifteen students each) were videotaped using the scenario. Their reactions formed the basis of revised questionnaires, improved role-play and refined teaching methodology.

Two further university classes used the new version in the Spring. These were also advanced undergraduates in Education courses, having 15 students each. One of these classes was also videotaped; questionnaires were administered to both.

The initial protocols for coding and statistical analysis of the questionnaire were set using these results.

The university students' comments were illuminating. They looked at the role-play both as students and as present or future teachers. Student response and tape analysis led to a completed package.

This package included the role-play itself, the rationale underlying

its use and a rating scale for assessing its implementation. Together with student and teacher questionnaires it formed the basis of a thesis proposal which was accepted in April of 1988. Three school boards were now asked to permit their teachers to participate in the project. Immediate and wholehearted support was shown by all those approached.

A final piloting of the package with the target student population was necessary before actually beginning the study. One Grade Seven science teacher was approached for this purpose, with school board approval, and kindly agreed. The researcher conducted the role-play with the volunteer teacher's class and videotaped the process. This led to the final revisions in the package. There were several important changes, especially in the wording and structure of the questionnaires. These changes preclude direct comparison of responses from pilot groups with the study group.

Segments of the various videotaped role-plays were now selected which demonstrated the essential stages of the role-play. These were combined to form a demonstration tape for presentation at the workshop.

3.1.2. The Study Group

Three school boards were approached; they released their Grade Seven science teachers for an afternoon and provided a meeting place at their central offices. Lists of Grade Seven science teachers were given to the researcher and these people were phoned and informed of the upcoming meeting and its purpose. A total of twenty-four people attended the workshop, which was carried out twice.

The study group consisted of fourteen teachers, thirteen men and one woman, working for two school boards. All were classroom teachers involved in the Grade Seven science program except for one who exchanged classes with the regular Grade Seven teacher in order to participate. One teacher combined two classes of twenty students into one class for the project.

A second teacher conducted the project with three separate classes. Overall the fourteen teachers were observed teaching a total of sixteen groups for two periods each. These groups ranged in size from twelve to forty-five students. Rural and urban schools were involved.

3.2. The Study Design

Having arranged for the teachers in the study, there were three remaining phases: Workshop, Implementation and Data Analysis

3.2.1. Format of the workshop

The workshop was held twice. The St. John's Roman Catholic School Board offered its Board Office in St. John's and the first workshop was held there Friday, April 22, 1-3 p. m. Teachers from the neighboring school boards of Avalon North Integrated and Conception Bay North Roman Catholic met at the Central Office of the Avalon North School Board in Spaniard's Bay, Wednesday, May 4, 1-3 p. m.

The two-hour workshop explained the rationale for inclusion of role-playing in teacher repertoire and its possible uses in science classes. The format is detailed below. Essentially the workshop provided an introduction to role-play in science classes, familiarized teachers with the instructional package and provided an opportunity for teachers to experience a role-play. The workshop followed in part the training design recommended by Showers, Joyce and Bennett (1987): theory - demonstration - practice - feedback. Extra time was included for discussion of teacher thoughts about role-playing in general, the instructional package in particular and how and when they might introduce the role-play.

Workshop Program

1. Purpose of the study

2. Rationale for introduction of role-playing

3. Benefits for teachers and students

4. Design of the project:

    a. Teacher participation

    b. Student participation

5. Videotaped demonstration of classroom role-playing. Videotape segments from the pilot studies which illustrated the technique were shown. These included four segments of the Grade Seven class showing the major stages of role-play outlined in the curriculum package.

6. Practice role-play. The teachers participated in a small group role-play of an environmental science issue (illegal hunting) operating in groups of three. This served as a starting point for discussion of the possible uses and pitfalls of the method, especially for those new to using it. It also provided feedback for the discussion of the teaching model.

7. Examination of classroom materials. The teachers viewed the curriculum package and accompanying project materials. These materials are included in this report as Appendices. They included the role-play and rationale for its use (Appendix A), samples of the student questionnaires (Appendices E and F), the parental consent form (Appendix D) for duplicating and distribution to the students' parents, and the rating scale developed to assess the role-play (Appendix I).

8. Brief Questionnaire. The teachers were asked to fill out and return a questionnaire (Appendix G) detailing their background and current teaching assignment, and giving their initial reaction to the role-playing method. A further section of the questionnaire asked for the teachers' attitudes to science and teaching science.

9. Scheduling of two classroom visits. Those teachers who wished to continue with the project could schedule class visits immediately or make arrangements later.

3.2.2. Implementation of the Role-Play

Each of the participating teachers arranged to implement the role-playing in their Grade Seven classes during two class periods between April and June. Visits were arranged at the teacher's convenience.

3.2.2.1. The first class

The first class typically took thirty-five minutes, although there was a range from thirty minutes to one hour. The researcher gave a brief introduction summarizing the purpose of the research and administered questionnaires to the students. This took approximately ten to fifteen minutes. The teacher then introduced the role-play and assigned roles. The researcher took detailed notes of this procedure according to the rating scale (Appendix I).

3.2.2.2. The second class

In the second class, from one to seven days later, the students performed the role-play. Duration ranged from fifteen to thirty minutes. This was videotaped. The teachers typically led a brief discussion about the role-play afterwards. This ranged from five to fifteen minutes and was videotaped in all except two cases when the teacher specifically asked for the camera to be turned off.

Following the performance of the role-play and teacher debriefing of the class, students answered a second questionnaire and the researcher conducted a brief audiotaped interview with the teacher.

3.2.3. Data Collection

There were five measures used to examine implementation of the role-playing and reaction of students and teachers to this model of teaching:

- Student Questionnaire One
- Student Questionnaire Two

- Teacher Questionnaire
- Teacher Interview
- Role-Play Rating Scale

The objective information from all three questionnaires was coded for summary and analysis using the SPSS^x (1983) statistics package. Open-ended questions on the questionnaires and the teacher interviews were typed. The transcripts were then inspected for common themes and sample responses reported.

The data collection is summarized below followed by detailed discussion of each instrument used.

3.2.3.1. Overview

The study examined student and teacher reaction to the role-play as those related to student and teacher attitudes and the implementation of the role-play.

The initial student questionnaire (Appendix E) related student attitudes toward science and science class, and student assessment of their learning styles.

Student reaction to the role-play was measured through the second questionnaire (Appendix F). Reactions were related to general class involvement in the role play and observer judgments of the degree of role-play implementation. These judgments were arrived at in collaboration with a trained observer after viewing the videotapes and observational notes.

The teachers' attitudes to teaching and teaching background were gathered from a questionnaire (Appendix G). Teacher reaction to the role-play was measured through a semi-structured audiotaped interview using eleven questions (Appendix H).

The judgment of implementation was based on a rating form. The forms were supplemented by detailed notes and examination of the videotapes. The analysis of the videotapes was conducted in collaboration with another trained observer to obtain interrater agreement on the fidelity to the role-play model (Appendix K).

3.2.3.2. Student Questionnaire 1

This questionnaire (Appendix E) attempted to establish student attitudes in order to compare these with the outcomes of the role-play.

Schibeci (1982) asserts that Likert response items are the most common means of measuring attitudes to science. He concludes, in a comparison of Likert and Semantic Differential scales, that the Likert items are more appropriate for specific attitudes of high school students. The questionnaire items were constructed using the general guidelines suggested by Sudman and Bradburn (1982), Likert (1967) and Edwards (1957). Half of the items were stated in a positive way, half in a negative way, to minimize the effect of students responding in a set way. This strategy was not used with the questions on teaching method, since this would have made the questions difficult to understand. Four categories of response were used: strongly agree, agree, disagree and strongly disagree.

During the analysis of the data all questions were reworded, and the responses recoded, so that they read in a positive manner. For instance, question 3, student questionnaire one (Appendix E) was changed from "science makes me feel uncomfortable" to "science makes me feel comfortable", the ***strongly disagree*** response becoming recoded as ***strongly agree***. This resulted in easier comparison among questions during data analysis and reporting.

The questionnaire used twenty-two Likert scale items. The questions regarding attitude to science were modified from Wright (1982) and Shaw and Wright (1967) . The questions regarding teaching methods were

devised for this questionnaire. The overall reliability of the questionnaire, using Cronbach's Alpha, was .83, as reported in Table 3.1. The questionnaire items in this and subsequent tables (3.2 through 5.4) have been abbreviated. The full text of each question appears in the appropriate appendix.

The overall length of the questionnaire was governed by the time constraints of the project. The entire introductory class plus questionnaire had to be completed in forty minutes, the usual class time.

Following Gardner (1976), a separate open-ended question asked students about ambivalence towards any of the Likert items.

The questions addressed three constructs of student attitudes: attitude toward school, science and science class. The last concentrated on how well the students liked and felt they learned from various teaching methods. An open-ended question allowed students to comment further on how they liked to learn and on science class in general.

3.2.3.3. Student Questionnaire 2

This questionnaire (Appendix F) mainly explored student reaction to the role-play.

The questionnaire was similar to the first. There were nine Likert items, a question on possible ambivalence towards them, and four open-ended questions.

Six of the Likert items concerned student response to role-play. Two of these paralleled the teaching method questions of Questionnaire 1 for direct comparison with them. The other three questions were replicated from the first questionnaire and concerned student attitudes about the nature of science. They were included to indicate change in student opinion from the first questionnaire. The reliability (Cronbach's Alpha) of the second questionnaire's items on attitude to role-play was .79, as reported in Table 3.2.

Table 3.1

Reliability Analysis - Questionnaire One[1]

Item 1:	Science interesting
Item 2:	I do like science
Item 3:	People can do science
Item 4:	Science is favorite
Item 5:	Science comfortable
Item 6:	Do well in science
Item 7:	Like all my subjects
Item 8:	Science gives more than one correct answer
Item 9:	Do well in school
Item 10:	Science useful
Item 11:	Like - teacher talks
Item 12:	Like - discussion
Item 13:	Like - lab activity
Item 14:	Like - field trip
Item 15:	Like - demonstration
Item 16:	Like - seatwork
Item 17:	Learn - teacher talks
Item 18:	Learn - discussion
Item 19:	Learn - lab activity
Item 20:	Learn - field trip
Item 21:	Learn - demonstration
Item 22:	Learn - seatwork

RELIABILITY COEFFICIENTS

N OF CASES = 351.0 N OF ITEMS = 22

ALPHA = 0.8266

[1]Full text of questions appears in Appendix E

Table 3.2

Reliability Analysis - Role-Play Response[2]

Item 1:	Enjoyed role-play
Item 5:	Role-play a good class
Item 7:	Like more role-plays
Item 8:	Like: role-play
Item 9:	Learn: role-play

RELIABILITY COEFFICIENTS

N OF CASES = 420.0 N OF ITEMS = 5

ALPHA = 0.7879

[2]Full text of questions · appears in Appendix F

3.2.3.4. Teacher Questionnaire

The questionnaire provided background information on the teachers' age, science education and science teaching experience (Appendix G). It asked for teachers' thoughts about teaching methods or strategies they use in science class. They were asked to specify and rank their teaching methods by use, effectiveness and personal enjoyment.

The questionnaires provided information on the teachers' openness to different teaching methods and the student-centeredness of their teaching.

3.2.3.5. Teacher Interview

Eleven questions asked teachers to comment on drawbacks and advantages they had seen in using the role-playing model as a teaching strategy in their science class (Appendix H).

3.2.3.6. Role-Play Rating Scale

The judgment of implementation was based on a rating form (Appendix I). This scale was modified from the steps described for performance of role-playing by Joyce and Weil (1980) using terms suggested by them in conjunction with an expert in the use of the method.

The scale has four stages. These were introduced and illustrated during the workshop. They are:

- Introduction/Warmup
- Role Assignment/Planning
- Role-Play Performance
- Debriefing

The forms were supplemented by detailed notes and examination of the videotapes. A measure of the reliability of the scale was obtained by interrater reliability check. The check covered the parts of the scale which

were videotaped. The videotapes were viewed and scored independently by two experts, then compared. The interrater reliability was 88 per cent, using Hartmann's 1977 formula (Scott and Hatfield, 1985) as described in Appendix K.

The scale has face and logical validity in its agreement with the terminology of Joyce and Weil, its correspondence to the role-playing model presented in the workshop and the judgment of two experts in the use of role-play.

Chapter 4
Analysis of the Student Questionnaires

The chapter is divided into separate discussion of the responses on Likert items and open-ended questions.

4.1. Analysis of the Student Attitudes on Likert Items, Questionnaires One and Two

The student questionnaires included a total of twenty-two items. Responses for each item on each questionnaire are reported in Tables 4.1 and 4.2. These are reported by number and per cent for males and females separately and for the students overall.

Items 1, 2 and 5 report the students' general feeling of affection for science. The words 'like', 'interesting' and 'comfortable' are used. The percentage of students agreeing and strongly agreeing to these statements ranged from seventy-seven to eighty-three. Only twenty-four percent agreed or strongly agreed with the statement that science was their 'favorite' subject (Item 4). By contrast, thirty-six percent liked all their subjects (Item 7).

Items 6 and 9 report the students' academic success with science in relation to their other courses. Seventy-six percent agree or strongly agree that they do well in science (Item 6), versus fifty-six percent who feel similarly about school overall.

Student reaction for three items was compared before and after the role-play. In all three cases there was slight change, but in no case was the

Table 4.1
Questionnaire One: Response by Sex

	Gender				Total	
	FEMALE		MALE		N	Col. %
	N	Col. %	N	Col. %		
Item 1: Science interesting						
STRONGLY DISAGREE	2	1%	10	4%	12	3%
DISAGREE.....	33	17%	25	11%	58	14%
AGREE.....	121	62%	131	57%	252	59%
STRONGLY AGREE...	40	20%	62	27%	102	24%
Item 2: I do like science						
STRONGLY DISAGREE	7	4%	10	4%	17	4%
DISAGREE.....	35	18%	33	14%	68	16%
AGREE.....	110	56%	118	52%	228	54%
STRONGLY AGREE...	43	22%	68	30%	111	26%
Item 3: People can do science						
STRONGLY DISAGREE	9	5%	4	2%	13	3%
DISAGREE.....	12	6%	16	7%	28	7%
AGREE.....	58	30%	86	38%	144	34%
STRONGLY AGREE...	117	60%	122	54%	239	56%
Item 4: Science is favorite						
STRONGLY DISAGREE	45	23%	56	24%	101	24%
DISAGREE.....	106	55%	113	49%	219	52%
AGREE.....	27	14%	36	16%	63	15%
STRONGLY AGREE...	16	8%	24	10%	40	9%
Item 5: Science comfortable						
STRONGLY DISAGREE	6	3%	10	4%	16	4%
DISAGREE.....	15	8%	25	11%	40	9%
AGREE.....	101	52%	123	54%	224	53%
STRONGLY AGREE...	73	37%	71	31%	144	34%

Results include all Teachers [n=14], Classes [n=17] and Students [n=468]. Males [n=249]; Females [n=206]

Table 4.1 (continued)
Questionnaire One: Response by Sex

	Gender				Total	
	FEMALE		MALE		N	Col. %
	N	Col. %	N	Col. %		
Item 6: Do well in science						
STRONGLY DISAGREE	10	5%	20	9%	30	7%
DISAGREE.....	45	23%	38	17%	83	20%
AGREE.....	117	60%	139	61%	256	61%
STRONGLY AGREE...	22	11%	30	13%	52	12%
Item 7: Like all my subjects						
STRONGLY DISAGREE	25	13%	69	30%	94	22%
DISAGREE.....	84	43%	92	41%	176	42%
AGREE.....	55	28%	52	23%	107	25%
STRONGLY AGREE...	32	16%	14	6%	46	11%
Item 8: Science gives more than one correct answer						
STRONGLY DISAGREE	24	13%	28	13%	52	13%
DISAGREE.....	78	41%	98	44%	176	43%
AGREE.....	73	38%	74	33%	147	36%
STRONGLY AGREE...	15	8%	24	11%	39	9%
Item 9: Do well in school						
STRONGLY DISAGREE	13	7%	22	10%	35	8%
DISAGREE.....	66	34%	87	38%	153	36%
AGREE.....	96	49%	97	43%	193	46%
STRONGLY AGREE...	20	10%	21	9%	41	10%
Item 10: Science useful						
STRONGLY DISAGREE	8	4%	14	6%	22	5%
DISAGREE.....	41	21%	40	17%	81	19%
AGREE.....	80	41%	96	42%	176	41%
STRONGLY AGREE...	67	34%	79	34%	146	34%

Table 4.1 (continued)
Questionnaire One: Response by Sex

	Gender				Total	
	FEMALE		MALE		N	Col. %
	N	Col. %	N	Col. %		
Item 11: Like - teacher talks						
STRONGLY DISAGREE	36	19%	74	33%	110	26%
DISAGREE.....	70	36%	71	32%	141	34%
AGREE.....	70	36%	65	29%	135	32%
STRONGLY AGREE...	18	9%	15	7%	33	8%
Item 12: Like - discussion						
STRONGLY DISAGREE	12	6%	7	3%	19	4%
DISAGREE.....	26	13%	27	12%	53	13%
AGREE.....	100	51%	113	50%	213	50%
STRONGLY AGREE...	57	29%	81	36%	138	33%
Item 13 Like - lab activity						
STRONGLY DISAGREE	4	2%	1	0%	5	1%
DISAGREE.....	8	4%	7	3%	15	4%
AGREE.....	63	32%	60	26%	123	29%
STRONGLY AGREE...	121	62%	160	70%	281	66%
Item 14 Like - field trip						
STRONGLY DISAGREE	1	1%	4	2%	5	1%
DISAGREE.....	3	2%	4	2%	7	2%
AGREE.....	33	19%	29	13%	62	16%
STRONGLY AGREE...	140	79%	184	83%	324	81%
Item 15 Like - demonstration						
STRONGLY DISAGREE	3	2%	6	3%	9	2%
DISAGREE.....	13	7%	12	5%	25	6%
AGREE.....	92	47%	91	40%	183	43%
STRONGLY AGREE...	87	45%	119	52%	206	49%

Table 4.1 (continued)
Questionnaire One: Response by Sex

	Gender				Total	
	FEMALE		MALE		N	Col. %
	N	Col. %	N	Col. %		
Item 16 Like - seatwork						
STRONGLY DISAGREE	51	26%	67	29%	118	28%
DISAGREE.....	92	47%	118	52%	210	50%
AGREE.....	43	22%	41	18%	84	20%
STRONGLY AGREE...	9	5%	2	1%	11	3%
Item 17 Learn - teacher talks						
STRONGLY DISAGREE	10	5%	12	5%	22	5%
DISAGREE.....	24	12%	32	14%	56	13%
AGREE.....	103	53%	122	54%	225	53%
STRONGLY AGREE...	59	30%	61	27%	120	28%
Item 18 Learn - discussion						
STRONGLY DISAGREE	3	2%	8	4%	11	3%
DISAGREE.....	23	12%	13	6%	36	9%
AGREE.....	108	55%	127	56%	235	56%
STRONGLY AGREE...	61	31%	80	35%	141	33%
Item 19 Learn - lab activity						
STRONGLY DISAGREE	3	2%	3	1%	6	1%
DISAGREE.....	13	7%	13	6%	26	6%
AGREE.....	86	44%	102	45%	188	44%
STRONGLY AGREE...	94	48%	110	48%	204	48%
Item 20 Learn - field trip						
STRONGLY DISAGREE	6	4%	4	2%	10	3%
DISAGREE.....	22	13%	24	11%	46	12%
AGREE.....	74	43%	83	38%	157	40%
STRONGLY AGREE...	69	40%	106	49%	175	45%

Table 4.1 (continued)
Questionnaire One: Response by Sex

	Gender				Total	
	FEMALE		MALE		N	Col. %
	N	Col. %	N	Col. %		
Item 21 Learn - demonstration						
STRONGLY DISAGREE	4	2%	4	2%	8	2%
DISAGREE.....	17	9%	14	6%	31	7%
AGREE.....	96	49%	119	52%	215	51%
STRONGLY AGREE...	77	40%	92	40%	169	40%
Item 22 Learn - seatwork						
STRONGLY DISAGREE	16	8%	35	15%	51	12%
DISAGREE.....	55	28%	54	24%	109	26%
AGREE.....	94	48%	116	51%	210	50%
STRONGLY AGREE...	30	15%	23	10%	53	13%

Table 4.2
Questionnaire Two: Response by Sex

	Gender				Total	
	FEMALE		MALE		N	Col. %
	N	Col. %	N	Col. %		
Item 1: Enjoyed role-play						
STRONGLY DISAGREE	2	1.0%	2	.8%	4	.9%
DISAGREE.....	1	.5%	5	2.1%	6	1.4%
AGREE.....	57	29.8%	62	26.3%	119	27.9%
STRONGLY AGREE...	131	68.6%	167	70.8%	298	69.8%
Item 2: People can do science						
STRONGLY DISAGREE	4	2.1%	9	3.8%	13	3.1%
DISAGREE.....	9	4.7%	10	4.3%	19	4.5%
AGREE.....	58	30.4%	82	34.9%	140	32.9%
STRONGLY AGREE...	120	62.8%	134	57.0%	254	59.6%
Item 3: Science gives more than one correct answer						
STRONGLY DISAGREE	25	13.2%	32	13.7%	57	13.4%
DISAGREE.....	72	37.9%	88	37.6%	160	37.7%
AGREE.....	66	34.7%	86	36.8%	152	35.8%
STRONGLY AGREE...	27	14.2%	28	12.0%	55	13.0%
Item 4: Can use science						
STRONGLY DISAGREE	5	2.7%	18	7.7%	23	5.5%
DISAGREE.....	28	15.0%	35	14.9%	63	14.9%
AGREE.....	70	37.4%	99	42.1%	169	40.0%
STRONGLY AGREE...	84	44.9%	83	35.3%	167	39.6%

Results include all Teachers [n=14], Classes [n=17] and Students [n=453]. Males [n=249]; Females[n=206]

Table 4.2 (continued)
Questionnaire Two: Response by Sex

	Gender				Total	
	FEMALE		MALE		N	Col. %
	N	Col. %	N	Col. %		
Item 5: Role-play a good class						
STRONGLY DISAGREE	2	1.1%	2	.9%	4	.9%
DISAGREE.....	4	2.1%	8	3.4%	12	2.8%
AGREE.....	60	31.6%	93	39.9%	153	36.2%
STRONGLY AGREE...	124	65.3%	130	55.8%	254	60.0%
Item 6: Role-played before						
STRONGLY DISAGREE	41	21.5%	60	25.5%	101	23.7%
DISAGREE.....	75	39.3%	76	32.3%	151	35.4%
AGREE.....	56	29.3%	59	25.1%	115	27.0%
STRONGLY AGREE...	19	9.9%	40	17.0%	59	13.8%
Item 7: Like more role-plays						
STRONGLY DISAGREE	1	.5%	3	1.3%	4	.9%
DISAGREE.....	2	1.0%	7	3.0%	9	2.1%
AGREE.....	49	25.7%	64	27.4%	113	26.6%
STRONGLY AGREE...	139	72.8%	160	68.4%	299	70.4%
Item 8: Like: role-play						
STRONGLY DISAGREE	4	2.1%	1	.4%	5	1.2%
DISAGREE.....	7	3.7%	7	3.0%	14	3.3%
AGREE.....	58	30.5%	70	29.8%	128	30.1%
STRONGLY AGREE...	121	63.7%	157	66.8%	278	65.4%
Item 9: Learn: role-play						
STRONGLY DISAGREE	4	2.1%	8	3.4%	12	2.8%
DISAGREE.....	8	4.2%	16	6.8%	24	5.6%
AGREE.....	68	35.6%	83	35.5%	151	35.5%
STRONGLY AGREE...	111	58.1%	127	54.3%	238	56.0%

difference large. Forty-five per cent of students initially agreed and strongly agreed that science gives more than one correct answer to a problem (Item 8). On questionnaire Two this changed to forty-nine per cent (Item 3). Seventy-five per cent initially reported the usefulness of science in everyday life (Item 10), versus eighty per cent on the second questionnaire (Item 4). Ninety percent of the students initially agreed and strongly agreed that ordinary people can do science (Item 3), ninety-three percent reported this on the second questionnaire (Item 2).

Three questions on the second questionnaire concerned student experience of and reaction to the role-play. Fewer than half had experienced this teaching method before (forty-one percent, Item 6). Ninety-six percent agreed or strongly agreed that it made a good class (Item 5) and ninety-seven percent agreed or strongly agreed that they would like to do more.

The balance of both questionnaires (fourteen items: numbers 11 to 22, Questionnaire One; 8 and 9, Questionnaire Two) concerned student assessment of various teaching methods. Two questions were asked about each of seven methods: whether the student liked the method and whether they felt they learned from it. Over eighty percent of students agreed or strongly agreed that they liked most methods (discussion, lab activity, field trip demonstration and role-play). The majority disagreed or strongly disagreed with similar statements concerning teacher talk (sixty percent) and seatwork (seventy-eight percent). The difference between these two groups of methods was less obvious when students were asked whether they learned well from each. Although only sixty-three percent of the students agreed or strongly agreed that they learned well from seatwork, over eighty percent felt this way about the other methods mentioned.

4.2. Analysis of Student Attitudes on Open-Ended Questions

4.2.1. Overview of Findings from Student Comments on the Questionnaires

Students had the opportunity to answer five open-ended questions. Two of these were relatively general and the other three referred to the role-play alone. The general question on the first questionnaire asked students for comments on their science class and how they liked to learn. Response to this question revealed strong ideas on and judgments of science and teaching methods. To a lesser extent students expressed their personal goals and impressions of their teachers.

The other four questions were on the second questionnaire. The first three of these concerned the role-play exclusively.

Question one on the second questionnaire asked students what they felt they had learned from the role-play. Students who answered the question suggested many outcomes of the role-play. These included a vaguely specified increase in understanding science and ecology. A few said they had learned nothing. Much of the learning that was claimed for the class had little to do with curriculum content. Students felt they had learned something about acting, personal and social awareness and the role-play itself.

Question two asked students what they had liked best about the role-play. The outcome most mentioned was their own and others' active involvement and the opportunity to express their views. Other answers included being videotaped and a specific outcome of the role-play, winning.

Question three asked for the least liked outcome of the role-play. Students gave a narrower range of responses to this question. These focused on procedural judgments such as comments on the unfairness of the judgments and lack of opportunities to speak. Being on the losing side was mentioned

often. Many students simply said that they had disliked nothing. A few students mentioned that the camera made them uncomfortable.

The last question asked students for further comments on the role-play and/or their science class in general. Fewer students responded to this item than to the others. Variety of answers was, perhaps correspondingly, narrow. Many students concentrated on the procedure and outcomes of the role-play and its utility as a teaching method. These were very favorable. A smaller group of answers concerned science overall. These very often reflected positive attitudes toward science and a desire for specific experiences such as field trips.

The questions are now taken in turn with illustrative quotes from the questionnaires. All quotations are verbatim, with occasional interpolations for clarity. These interpolations are indicated by square brackets. All references to named individuals are indicated by the letter T. for teachers, and S. for students.

4.2.2. Open-Ended Question, Questionnaire One

The item was worded as follows:

> Finally, if there's anything you'd like to say about your science class or how you like to learn, feel free to comment in the space below.

Responses included comments on science, personal goals, assessment of teaching method and assessment of teachers.

4.2.2.1. Comments on science

Students took the reference to science class in the question to include both the subject area and science class:

> I like science class and want to learn more about science.
>
> Science is an interesting subject to me, I like to learn different things even though it's not my favorite subject.
>
> I like science class, it's just that sometimes it's hard.

Students sometimes viewed science and science class in a negative light:

I think science is boring.

I don't like science very much.

and, rarely, in an extremely negative way:

I hate science class.

Sometimes the reasons for a negative outlook are given by comparison to wider experiences:

When I watch shows on television about science I find it very interesting, but when I learn it in school, I learn but it's not as interesting.

or otherwise qualified:

I feel science has an interest to some people but I don't like it.

I think science is very boring and I hate it

Some students related their attitude to their academic performance:

I don't like science class so that's why I don't do good in it.

I think science is a very hard subject but anyone can do it!! but me!

Sometimes a negative view is overridden:

I like science but it is very hard to learn.

References were much more likely to be positive, the students terming science and science class interesting, fun and great. Some students said they love science:

I like my science classes.

I like science class and want to learn more about science.

These positive comments are frequently elaborated:

My science class is a good learning experience for me.

Science class helps me learn. I love science. I always get good marks in science because it's my favorite subject.

The reasons given for a positive attitude may be very broad:

I feel that science gives us a good view of the earth [and] the many species on it

I like science because I learn something new everyday.

or relatively specific:

I like science because it [teaches] me to become more careful about my work.

Limitations are sometimes placed on a generally positive outlook:

I like science to a point. It's interesting but sometimes a bit dull.

Science is an interesting subject to me, I like to learn different things even though it's not my favorite subject.

4.2.2.2. Comments on teaching methods

The majority of comments cited specific preferences for teaching methods in response to this question:

I love science when we have laboratory activity as stated.

I like to learn science when we do experiments and then discuss what we have done.

I like to learn by watching experiments.

Specifications can be very precise:

I especially like to learn science when the teacher does an experiment using everyday utensils and familiar objects.

A teaching method is sometimes held to intensify an overall positive attitude:

I like science but love it when we have field trips, or experience the lab project.

Science class is very exciting and fun, especially when we do activities.

Alternately, specific methods can alleviate a negative situation:

Science is one of my worst subjects. I don't do that good in science because I don't usually study but I like the field trips and activities.

I would like it more if we would go to the lab more often.

Teaching methods can be contrasted:

Demonstration and talking is much more fun than seatwork.

Science class is more interesting when we go to the lab instead of staying in class.

I feel that science should be more fun, with more discussion, demonstrations and field trips (less writing and seat work).

Students rarely mentioned methods other than field trip, laboratory use, demonstration and discussion in a positive light. Occasional favorable mention was made of film:

I'd like to see more lab activity and films. So far science was pretty good.

although specific content of films could arouse anger:

I hate science classes when the teacher gets films that have snakes in it.

4.2.2.3. Comments on teachers

A final category of response concerned assessments of the teachers. Some teachers were perceived as undesirable for personal reasons:

I wish T. would leave me alone.

or for their methods:

I feel we never get any field trips and we can't understand some of them [notes] because T. doesn't take his time.

However such harsh judgments were rare. Most assessments were by and large positive, and often accompanied by reasons for the assessment:

During science class I found that T. is very informative and [sort of] interesting [too], because he knows things and can help us with our demonstrations

I feel that our teacher teaches science in a funny way.

I like science class because T. teaches wisely and sometimes tells jokes

4.2.3. First Open-Ended Question, Questionnaire Two

The item was worded as follows:

What do you feel you learned from doing the role-play?

Responses included comments on science, ecology, and science class as well as specific mention of increased personal and social awareness, general positive responses and specific comments on the role-play. Very few students responded that they had learned nothing. The sample responses are grouped into the following categories: (i) academic learning, (ii) personal and social awareness, (iii) involvement in role-play.

4.2.3.1. Academic learning

Class involvement was often felt to result in an increased understanding of science and ecology, frequently the nature of this learning was not specified:

> I feel I know more about science and ecology.
>
> I feel like I learned a lot more about science.
>
> Things about nature.

Students often elaborated on this academic learning, mentioning new insights:

> I feel I learned a lot about what really goes on in science around us.
>
> I learned that making decisions about scientific experiments isn't easy.
>
> There are facts about the world I don't know.

Often too they had come to definite conclusions about the matter debated:

> I feel I learned that a study of the grounds is more important than a mine.
>
> I feel I learned that tearing up the wood is wrong because there is a lot of dangers.

Mention of the proposed mine was typically from an environmental viewpoint:

> I learned a lot about mines and what can happen if you start one.
>
> I learned how an ecosystem or food-chain can be destroyed by a project like a mine, building, etc.

The interplay of science and society was singled out by several students:

> I learned how development can affect the environment and what a part politics has in it.
>
> I learned that ordinary people can do science and that the environment is important.

A few students felt they could look at class in a new way:

> I learned that science is not only seatwork and ordinary thing you can have fun in science class.

Several students asserted general positive feelings:

I learn that science can be fun.

I learned that science can be interesting and fun.

4.2.3.2. Personal and social awareness

Students frequently drew lessons about their ability to communicate:

I learned about how to present your argument in a suitable way.

I think I learned how to debate more.

I learned how to speak my views

and how it might be improved:

I learned that it is better having your facts straight about what you are talking about.

Several students discovered aspects of their acting ability:

I learned that you can act something you disagree with.

I learned that I could pretend to be someone I'm not.

or improved on it:

I feel I learned how to act better.

A number of students made generalizations which seemed to reflect positive thinking:

I learned that if you really want something you have to give it all you got.

I learned that there are two sides to everything. If a person can present a good argument, he can make a big difference.

I felt that... you can win if you really want.

Others were stoic losers:

I learned that you can't always win but it was fun.

Many students extrapolated from their roles to a sympathy with others. This occurred at both a general level:

I feel I have learned from doing the role-play is [the] position people are put in when making difficult decisions concerning the life of others.

I have learned that every decision you make can change something. I also realized how people who are unemployed feel.

and at a more specific level:

I learned how to control one [role-play] and realized what a judge must feel like.

A large number of respondents generalized from their experience to broader social situations:

I feel I learned that people have to decide what they think is right.

I learned about issues which the government has to face.

I have learned that I always have to listen to someone else's side. But stick up for what I think is right.

I feel I've learned what it's like to be a part of a group that is opposing something they believe will hurt them.

4.2.3.3. Role-Play

Many students answered the questions in terms of the enactment itself drawing conclusions about the mine:

I learned that the mine should have a study done because of the forest and marsh.

I have learned why the mine has to be studied first.

Others commented on the apparent reality of the experience:

I felt like the play were for real.

Some students simply felt they had learned what role-playing was about:

I feel I learned a lot of what a role-play is really like.

I learned how you do a role-play and how it is.

or their attitude to it:

I feel it was pretty fun doing the role-play.

Several students made overall judgments of the role-play

I learned the role-playing can give a lot of ideas and get you very interested.

I learned that role-playing can be fun and also serious.

One student gave a more elaborate evaluation:

It gave me a new and more interesting way of looking at things. I had fun researching and coming up with arguments. I'd like it if most subjects could be taught in this manner.

4.2.4. Second Open-Ended Question, Questionnaire Two

The item was worded as follows
What did you like best about doing the role-play?

Responses included comments on student expression, for instance the debating and arguing. Various comments related to the running of the role-play. These were often general reactions, or mentioned winning and the videotaping.

4.2.4.1. Student Expression

Responses overwhelmingly referred to some aspect of student expression during the role-play. This included self-expression and, the expression of other students, especially when this was heated or involved some degree of controversy.

Students were pleased at the opportunity to speak out. This was often stated in a plain way:

When I got up and spoke.
I liked expressing my feelings.
You got a chance to express your feelings.

Others felt the content of their speech to be important:

I liked best saying my ideas when I know they're true.
I like bringing up the subject and to bring the truth up.

The ability of other students to speak up was also considered one of the best liked aspects of the role-play:

I liked it best when the speakers gave their opinion.
I liked hearing the presentation each person gave.

The democratic organization was pointed out:

Everybody got a chance to speak.
The thing I like best about doing the role-play was everybody saying a little part.

Taking part in debate or argument was often felt to be important:

I like to debate the best.

The part I liked best about the role-play was the arguments.

Some students chose particular aspects of the debate:

What I liked best was when Cecil Rhodes, that's me, argued with Henry Killem, that's S.

Still other students thought the debating was pleasant as a spectator sport:

I liked best when everyone started disagreeing with each other that's what made it more exciting.

I liked sitting down and watching the arguments.

There was an element of defying authority or classroom norms in some student praise of debating:

I liked the fighting from one side to the other side.

I liked it when S. (my friend) raised his voice a lot.

however some students stressed the democracy of the debate:

I liked the argument best because everyone can get a point through.

I liked listening to other people's arguments and [them] listening to mine.

4.2.4.2. Role-Play

Many comments referred to specific aspects of the role-play such as being videotaped and winning the decision, although some students simply mentioned that it was fun or funny. Comments included references to roles played and just "getting involved". Several students felt the reality of the situation or importance of the decision deserved comment.

A few students didn't like anything about the role-play, and others felt the most likeable aspect was: "Time off class." Many had an overall positive outlook:

What I liked best about the role-play is it was fun.

The decision was important for several respondents, often explicitly because they 'won':

I liked the fact that my team won the argument.

The thing I like best about the role-play was who won the vote.

Some students asserted that they liked best having learned something from the role-play although what they learned varied:

I liked to be able to get involved and learn something.

What I liked best about doing the role-play was I learned to debate.

I learned from the role-play you can find out more about different places.

That we learn that people want different things.

Being involved and having a role were sometimes commented on:

The part I liked best is the part where I played Councillor Waitandsee.

The fun of saying your parts and then having people decide which side is right.

I liked being Watchdog and I like fighting for what I thought was right.

Several students felt that the situation was real:

The thing I liked best about the role-play was the authentication of the situation.

I liked to see all of the realism of the debate.

Several students liked the videocamera, because they were filmed:

I like getting on the camera.

I liked it about the video camera.

or because they had a chance to use it in their role as cameraperson:

I was a camerawoman and I learned how to work a camera and situations in science.

4.2.5. Third Open-Ended Question, Questionnaire Two

The item was worded as follows

What did you like least about doing the role-play?

Responses led to various comments on the role- play. Students found fault with aspects of the procedure or individuals. A few students singled out the videotaping as unpleasant, while many disliked losing. Several students had reservations about aspects of the presentations and debate.

Many students left this question unanswered, while the most frequent response was that nothing had been disliked.

4.2.5.1. Role-Play procedure

Several aspects of the role-play setup irked students:

> The thing I like least about role-play is limited as to how much time you have so you can't express everything you feel.

Some comments were general:

> What I liked least was the way it was organized.

others specific:

> I didn't like my name Bonnie House.

and were sometimes accompanied by reasons:

> I didn't like the new names because I fooled up a lot.

or solutions:

> I think it could have been like Parliament, letting everyone vote.

The video taping upset some students:

> I didn't like to be on the video camera.

these students sometimes had specific reasons for their dislike:

> Being on camera when my hair was messed up.
>
> I didn't like to talk and the camera being pointed on me because it's embarrassing in making a mistake.

4.2.5.2. Expression

Students sometimes disliked having to speak:

> I didn't like talking by myself.
>
> When I had to get up and say something.

but others felt they hadn't had enough chance to speak:

> Not being able to speak about what I thought.
>
> The councillors didn't get a chance to speak.

Still others criticized an apparent unwillingness or inability to take part:

> Some people wouldn't speak, or weren't prepared.
>
> No one would speak.
>
> I didn't like it when someone had disagreements but didn't say them.

Aspects of the arguing struck some students as wrong:

Saying bad ideas in front of good ideas.
There was not enough questions asked.

Some students felt that the arguing became too heated:

Too many people spoke at one time.
When people didn't give you a chance to talk.
When they were fighting about the mine.

or disorganized:

The least thing I liked about the play is how we laughed a lot.
I like the least when they went out of order.

The argument itself was difficult for some students:

Nothing only arguing with friends.
I contradicted someone.

4.2.5.3. Personal Comments

A variety of remarks were made regarding students' feelings about others:

I liked least doing the role-play because of certain people that played in it.
S. did not know what she was doing.

and themselves:

[The] thing I liked least about the role-play was being shy.
I was nervous.

One student found his decision-making role difficult:

The decision I had to make, could have been wrong and that is what I least like about doing the role-play.

4.2.6. Fourth Open-Ended Question, Questionnaire Two

The item was worded as follows:

Other comments: Is there anything else you'd like to say about the role-play (or your science class in general)?

This question had a low response rate with some students referring to aspects of their regular classes which they liked or disliked. However further comments on the role-play predominated. These were most often quite

favorable. As might be expected there was some overlap with comments from previous questions.

4.2.6.1. Science Class

Students occasionally offered comments on their regular classes. These were sometimes negative:

> No because sometimes it's a dull class.
>
> It's dull a lot of the time.
>
> I hate my science class because we do too much writing.

Students more often had positive things to say about their classes:

> I like my science class a lot because I am interested in science.
>
> This was the first year I did science, as an important subject. I really enjoy doing it and find it easy to understand. Science has become my favorite subject.

Such positive comments were often associated with particular aspects of the class:

> I like science because when you do experiments you get first hand experience.
>
> My science class is very helpful about talking about science.
>
> Science is okay. I like it because of outings, not just for fun but to learn about the environment.

4.2.6.2. Role-Play

Some students made further comments on individuals or the conduct of the meeting:

> S. thinks she knows everything but she don't know NOTHING.
>
> I'd like to be a mayor in a role-play.
>
> I think the mayor made a good decision.
>
> My other comments are that the speeches were too short.

A few students had further points to make about the situation:

> That the mine would not hurt the environment or animals and it would bring in lots of money to our community.
>
> Our side should have brought up to the mayor that: Even if the mine had a lot of gold and then money for the community, They

would have to wreck playgrounds and fields to build something. That wouldn't be nice for the children.

The great majority of comments, however, were favorable remarks about the role-play as a class. These were often simple statements like:

It was fun.

The role-play was fun.

I would like to say I loved it

Rad!.

Many students expressed the desire to use more role-play:

I want more role-plays PLEASE. Thank you, I had fun.

I think we should have more role-playing in science.

I enjoyed it very much and hope it will be a part of our science class.

Some students attributed educational advantages to the role-play:

I'd like to have more because we can learn from them.

It puts you in a position in which it is a learning experience.

Yes. It was fun and educational.

This was sometimes made more specific:

I think the role-play was great, as it made us aware of different situations.

No except that it is very educational in everyday life.

I think the role-playing gets the class more involved in science.

and suggested wider use:

I think this should be done for other classes not only science.

Still other students compared the role-play to their regular classwork:

Science is more fun in role-plays.

It was different and fun.

I thought science would never be fun.

If science could be taught this way, I'd be more eager to participate and do well.

although some students wished to distinguish it from proper science work:

Role-plays are good but you're not really learning science. I think

you learn science by just reading and learning right out of the book. Not by doing stuff like that. That was fun.

Chapter 5

Analysis of Teacher Interviews, Questionnaires and Role-Play Implementation

5.1. Analysis of Teacher Questionnaires

The questionnaires revealed the professional background of the teachers as well as their attitudes to science and science teaching.

Table 5.1 summarizes the qualifications of the teachers who took part. Although only one had a science degree, most had some University training in science. Few however had extensive course work in science. All had more than ten years of teaching experience and the great majority had more than five years experience teaching science. All possessed at least one, and the majority two, undergraduate degrees. Only one teacher had a Master's degree.

The majority of teachers were not primarily science teachers, spending less than forty percent of their week teaching science.

Teacher attitudes to science are reported in Table 5.2. The responses show a strong positive attitude to science, with all liking it and finding it interesting and useful. The majority felt it was their favorite subject. As well most teachers felt comfortable with science, and that ordinary people can do it.

Teachers were asked their attitudes to science teaching, their

Table 5.1
Teacher Professional Qualifications

Teaching experience [years]	
10-14	1
15-19	9
20-24	2
25+	1
Science teaching experience [years]	
0-4	2
5-9	1
10-14	3
15-19	4
20-24	2
25+	1
Percentage of week teaching science	
under 20	4
20-39	5
40-59	2
60-79	1
80-100	1
Teaching Certificate [level]	
5	5
6	7
7	1
Approximate number of University science courses completed	
0	1
1-5	8
11-15	2
21+	2
Have science degree	
Yes	1
No	12

Results for Teachers participating in study who completed questionnaires [n=13]

Table 5.2
Teacher Attitudes to Science

Item 1: Science interesting	
AGREE	6
STRONGLY AGREE	7
Item 2: I do like science	
AGREE	6
STRONGLY AGREE	7
Item 3: People can do science	
DISAGREE	1
AGREE	4
STRONGLY AGREE	8
Item 4: Science is favorite	
DISAGREE	4
AGREE	5
STRONGLY AGREE	4
Item 5: Science comfortable	
DISAGREE	1
AGREE	6
STRONGLY AGREE	6
Item 10: Science useful	
AGREE	5
STRONGLY AGREE	8

Results for Teachers participating in study
who completed questionnaires [n=13]

responses being reported in Table 5.3. All felt that science gives more than one correct answer to problems and that teachers should be willing to try new methods. Teachers were also unanimous in feeling that students do not learn best when told exactly what they should do. The great majority felt the teacher need not be at the center of the class and need not know exactly what is going to happen in class. A few teachers felt that students who did well in science class would often have a poor idea of what science is about.

Teachers were asked for their prior experience with role-play in science. Only one teacher had used role-play this year and only three had ever used role-playing in science before. One-half of those who responded to the question felt positive toward role-play and one-half felt strongly positive. This is reported in Table 5.4.

5.2. Analysis of Teacher Interviews

5.2.1. Overview of Findings from Teacher Interviews

A total of ten questions were asked the teachers following the role-play class. These concentrated on teacher reaction to the role-play and possible uses for the technique.

The overall response for the items was very positive with special mention of the motivation and enjoyment apparent among the students. No teachers found serious faults with the role-play, although some felt the available time was insufficient. Most felt they would make future use of the role-play. This included those teachers who mentioned an initial skepticism toward the notion of role-playing. Several teachers had ideas for the expansion of the technique to other areas of the science curriculum.

The responses are discussed individually below. All responses are verbatim, with occasional interpolations for clarity. These are signalled by square brackets. Reference to a specific student is indicated by the letter S.

Table 5.3
Teacher Attitudes to Science Teaching

Item 6: Willing to try new methods	
AGREE	6
STRONGLY AGREE	7
Item 7: Teacher should be at centre of class	
STRONGLY DISAGREE	1
DISAGREE	9
AGREE	3
Item 8: Science gives more than one correct answer	
AGREE	4
STRONGLY AGREE	9
Item 9: Students learn best when told exactly	
STRONGLY DISAGREE	4
DISAGREE	9
Item 11: Teacher should know exactly what is going to happen in class	
STRONGLY DISAGREE	1
DISAGREE	10
AGREE	2
Item 12: Students often has a poor idea of science	
STRONGLY DISAGREE	2
DISAGREE	6
AGREE	2
STRONGLY AGREE	1

Results for Teachers participating in study who completed questionnaires [n=13]

Table 5.4
Experience with and Initial Reaction to Role-Play

Have you used role-play this year in science?	
Yes	1
No	12
Have you ever used role-play in science?	
Yes	3
No	10
What is your feeling towards role-play?*	
Positive	6
Very Positive	6

Results for Teachers participating in study who completed questionnaires [n=13]
*One respondent omitted this question.

5.2.2. Question One

The item was worded as follows:
What did you like best about doing the role-play?

Several teachers commented on the participation of the pupils, as well as their enthusiasm:

> The fact that so many of them were able to participate.
>
> The motivation, the motivation in the kids. They wanted to take part, they dressed up and everybody wanted to get their fair say, it was good. Truly interesting.
>
> I think the enthusiasm of the kids was probably one of the best things I found about it. The kids were all eager to get going and once they got going, they continued to carry the ball, that is what I liked most, they did so much on their own.
>
> Yes, I am telling you they really dug into this. What I liked about it too was in around the class I never helped them. It would be different if I had to sit down with them and write something up with them or if I had to give them a class on it and say here [are] the ideas. But this is something that they took on their own and they discussed on their own in groups and I had a minimum of actual helping with ideas and writing out speeches or anything like that. What they did, they did on their own.

The involvement led to other positive consequences, involving students who are sometimes left out:

> The best thing I see about what we did here today is the fact that students got involved, they thought about the issues. It made them think.
>
> The students really enjoyed the class for starters and it gives some students an opportunity to take part, to express their own views where ordinarily they wouldn't be doing it.

Taking part was remarkable for some students:

> There are students who performed out there today, one boy in particular, he has never spoken out in class but today he got out and read what he had made up. He never had spoken up before.

Other teachers gave more emphasis to the aspect of student's thinking involvement:

> The thing that I liked best about it is the fact that you get a lot of people who try to bring out their ideas after, in the debate part. In the first part of it where each person is presenting, they are more or less reading what they have written down and it is probably something that you would take in as an assignment. In the debate part, everybody was expressing their views and some people who don't do that much, don't express themselves that much in class really got involved in the conversation and expressed their ideas as far as students are concerned. You are all the time trying to get them to bring out their ideas.

Teachers further commented on individuals who took on responsibility:

> Well, the children surprised me in the way that they prepared their work. I only told them about their roles yesterday and they obviously must have given it a considerable amount of thought. The way they presented their roles was good to me.

5.2.3. Question Two

The item was worded as follows:
What did you like least about the class?

There was a mixture of responses to this question, with mention made of time constraints, lack of student preparation and class size. Several people suggested modifications to the procedure to eliminate some of these problems:

> That is a difficult one. I don't think there was enough time involved to get everyone. I think if I was going to do it again, I would have more roles made up. I would give the children an opportunity to decide on what roles they would want to come up with themselves. I would have more participation. Right now, I have 45 people in the class and I had basically, I broke them down into groups of 3, which meant that only one particular person performed. I think another time I would either make the class smaller or I would have more roles.
>
> This being a new thing for my classes anyway, the students they didn't have their roles prepared well enough.
>
> Like in any role-play or drama type situation you will only get about one-third of the class participating. Of course the remainder, they are just sitting participants. Sometimes you will draw out a

person of course who doesn't normally speak up in the class but for most part it is usually confrontation between a maximum of about five or six people. Therefore, a lot of the kids are only participants in a silent manner. One way I can suggest is that to give everyone a role and a script and structure it so that they do have to respond or speak out. You could do that like in a public speaking situation where you have it in the classroom, everyone has to prepare something.

Of course there are some students who can be annoying:

There wasn't much about the class that I didn't like, I suppose, I got to say I liked least about maybe is the problem that you always have is some of these kids try to clown around and not take the thing seriously. You always have these no matter what type of class you are in. Other than that, I thought it was great.

The lack of student experience with the teaching method was noted as a cause of some drawbacks to the role-play:

The only thing that I see there is that you know this is the first time around and obviously with a little more experience, the kids will be more prepared for it. Everything has to be done once, to get a little bit of experience, and you get a better feel for it.

Several people commented on the difficulty of finding something to criticize, as the teacher who said:

What did I like least? God I don't know. I thoroughly enjoyed it. I can't say there was anything I didn't like. Everything went great I mean the kids you didn't have to prompt them, you didn't have any discipline problems or anything. It was interesting. The only thing I liked least was that there was so little time - I could have gone until three.

5.2.4. Question Three

The item was worded as follows:

Were you comfortable in your role as town clerk?

This question was modified to suit the circumstances of the role-play. Where teachers did not actively take on a role during the role-play, they were asked: *'Were you comfortable with the students having the central role in the classroom?'*

Among those who took on an active role, the general impression was one of no problem:

> Oh, very comfortable. I mean the kids are the ones that got to do the learning so if I can just sit back on the side and guide a few things, that's fine.
>
> Yes. Much more comfortable. I prefer it that way. Kids themselves running the show is a great way to have a class, actually.

One teacher saw it as a test of previous teaching, that the students could perform on their own:

> Yes, I think for once I enjoyed teaching in this particular aspect. I like teaching science but this aspect of it kind of put me in the shadow. Now I had to prepare them but when I saw that the way they could do it themselves, when they were given the opportunity made me feel good. Obviously, I must have been doing something before.

Among those who simply took a non-obtrusive position in the class the comments were very similar. In reference to not taking a role, one teacher suggested a pragmatic reason:

> I wasn't completely comfortable in the sense that I was supposed to be a part of the group yet I wasn't. I think the less I spoke and said the better .... As soon as I spoke once, the kids started addressing themselves [to me] which is natural in the classroom.

Teachers tended to see this as an opportunity for the students to stand on their own:

> I think in that case it gives you a chance for the student to show his characteristics. For instance, you see the mayor become a leader and it brings out who is the leader and who is not the leader in class and it certainly gives that opportunity for people in class, whereas, where you conduct in class and they are just making a comments on the questions, you can't tell one from the other.
>
> Well, in my role, I tried to stay out of it as much as possible. I would rather let the mayor run it as best he can. The only time I stepped in was when the mayor was out to sort of get the consensus and probably to get a little bit of discussion going, but other than that it is better to let the children run it as much as possible. Like you say, would be just an advisor.

One teacher mentioned the difficulty of relinquishing a law and order function, but even so felt the change to be a useful one:

> Yes, I must say I was. I must say it is a bit different. It is not your usual role. When you see some of the kids needing to be disciplined sometimes, it is kind of difficult not to get in there and do something but I think on the whole it was pretty good and I think if the kids did it more often, it would get better as it went on.

5.2.5. Question Four

The item was worded as follows:

How well do you think the students enjoyed the role-play?

One teacher reported the class had been quite negative and apprehensive before the role-play:

> Well, yesterday they weren't very enthused about it. They thought they were going to be put on the spot. Students came to me after and said, "Sir, have we got to do this?", I said, "Let's just try it and see how it works out", I said, "I'll put you in groups of three and you can decide which one to do". I think after today, I think if I put them in groups of three people, the three people would have something to say in each group. I think they really enjoyed it.

Most teachers reported more eager anticipation of the role-play:

> I think they thought it was great. In fact, they are after me every day since I noted that this was going to take place. Since they have gotten into it the first day that you were here, they really were all enthusiastic about it.
>
> They enjoyed it. They were nervous but they enjoyed it.

Two teachers related the anticipation to the camera and the opportunity to "act":

> Very much so and this was indicated by throughout the week, everytime I went in the class they asked me when you were coming in: "When is Mr. Coombes coming in to do the study?". Once again, to be quite honest, I think it has something to do with the fact that the camera was going to be there and they were going to ham it out for the camera.
>
> I think they enjoyed it a lot, everyone even those who didn't participate verbally. Once the debate started, I think they really got

into it in the sense that they not only spoke but they acted as well. They hit their fists and when I was preparing them, one of the things I tried to encourage them to do was that if you are going to make a point do it, but also you are role-playing and often you have to take on a role or cause that you don't agree with or that you are not familiar with but still defend that to the utmost of your ability with the knowledge you have and I think that they did that.

One teacher referred to comments made when the students went back to the classroom to write the second questionnaire:

> Well, when we went back and did that evaluation it seems that the whole lot of the class, particularly a lot of the people who don't participate in class mentioned that they would like to do it again and so on like that. The next class is when you would really get the comments on that because you really didn't have much time to speak to them after.

One class had been decimated by an invitational basketball tournament, and their teacher had no doubt that the enjoyment demonstrated warranted a replay:

> They really enjoyed it. As a matter of fact, like I mentioned, we will be [running] it again. Probably the same situation. We will try that one because there were so many students that missed it. They even talked about different situations there at the end.

5.2.6. Question Five

The item was worded as follows:

Were you happy with the way they acted in their roles?

This question was directed at the appropriateness of the student's behavior. For the most part responses were positive. One teacher for instance, said:

> Oh yes. As a matter of fact they did better than I thought they would. They took it very seriously.

Several, however, saw room for improvement:

> Some students took on roles quite well. Some I think maybe because it was their first time or whatever reason, I wasn't too

happy with some of the roles, no. Well, the student who played the role of the mayor for example, I instructed him, I gave him some advice on how to prepare his presentation and so on but he just went right into the thing and got people talking right away. I wanted them to give the background during the debate but the way he introduced the debate, I wasn't too pleased with that.

Yes in their roles. Maybe I would have liked to have involved some of the others if you could and if I had a little more time, maybe I would have. The other thing about it was that maybe I would have liked them to have used a little more of the things we did in class like the environment, habitats, pollution and so on .... They might have used the library a bit more.

One teacher noted that students did well despite unfavorable circumstances:

For most part yes, there were some - the timing is another thing affected us a little bit, in this case you came and then we had two days off for sports time and a long weekend and we didn't have either class in between, I found it myself coming back this morning after a long weekend, you are sort of not right into things normally. They seemed to be prepared after the weekend more than I expected really.

Several teachers noted the importance of one student in getting the ball rolling, as one teacher who said:

S. set the tone. She is a good speaker and I think she will be good at drama as well. She is always like that, she speaks her mind, she is a very quiet student, but she is an A student and she always expresses her opinion and she decided I think when I was talking about it to take on the role of something that she disagreed with and she did it well.

One teacher, noting a lack of spontaneity in some presentations, felt the students might have been over-prepared:

Yes, in fact they were too good. They were too - they had it too rehearsed so to speak - they knew exactly what they were going to say. If they had more ad lib material... that was probably my fault in a sense because I never emphasized that enough about the ad lib material. I asked them to have something ready so it wouldn't be absolutely quiet, silent, nobody speaking but I didn't think they would have it prepared as they did.

One teacher stressed that students would improve their involvement:

> Happy in one sense but it is the type of thing that will improve. I think they were more nervous and scared than anything else because it is the first time and the camera and a stranger in a classroom. All of these facts sort of inhibited them a small bit but as they do one or two more they will become quite comfortable with speaking in class and also being [videotaped].

Finally, several people commented on the individuals who had stood out. These students were often a pleasant surprise to the teachers:

> Yes. There were a few students who really surprised me. They really acted the part. One particular person, the Watchdog, the one who did the study - he really surprised me in that he portrayed like it should be. It is surprising at that age group, grade 7. He had his notes and he just flicked through his notes and he took up this piece of paper and this is the law. Very professional.

5.2.7. Question Six

The item was worded as follows:

Did they use any of the ideas they learned in science class?

Several teachers felt there was considerable room for improvement in this regard:

> Not a lot. They used some as regards to pollution, I tried to steer them in that direction. They do learn a lot of ideas in science class that didn't come up.

One teacher noted a paucity of ideas but saw it as a reflection of the students' inexperience:

> Some of the ideas that they used concerning pollution, environmental damage. My opinion is I think with more time they would probably have made up a much broader one. They would have looked for a lot more scientific issues. It is kind of a spur of the moment thing. They didn't, actually I suppose [have] enough time to put into it. I think that if they had to do this again, the same type of project, I think more science concepts would come across.

The teachers responses were quite positive overall. They felt diverse topics had been introduced by the students which reflected well on their background in science:

> The pro-side group did certainly. The environmental things like pollution, what is going to happen to forests and lakes and trees and the wildlife and I think that is why so many of them I think took a stand as opposed to the others.
>
> Oh yes. The idea of the ecology, the bird habitats, the fact of the animals, so you are looking at ecology there. Things like we did the ant farms and we are out here digging out for different types of life, respect for life and looking after things. They brought that up. The idea of course that money and profit is not the sole benefit and also of course they also used a bit of common sense as well. The idea of do the study first rather than just wait. They used ideas that we covered there and we have gone into other things, the nature, the ozone layer going away and that type of thing - spray cans and their effects. So it is all the environment - looking after things around you and they used that there. It was good to see too. It is good to see the transfer there.

Several teachers noted drawbacks in the time of year when the role-play was conducted. They remarked that the environmental science section of the course had been covered as much as several months earlier in some cases, and the students were not fresh on some of the topics. One noted a contrast with the previous year's students:

> Yes, much of them. We spent a whole year studying the ecology. Unfortunately, last year Grade Seven, which is Grade Eight today, they went up to the [Brother Brennan] Environmental Center. Basically these guys, if these guys had th. opportunity to go up they would probably even be able to use it more. They missed the sort of practical aspect of the ecology section. It was all study. They had the odd field trip, if they had spent a week up there [in the Environmental Center] it would have been ideal especially this class because of the enthusiasm.

Another teacher felt the timing quite good, however:

> For the most part, they used a lot of the things that we brought up in the last little while. The thing about this particular case, we had been working on the earth science section for one week before you did the actual thing, so they see some of the processes involved there.

5.2.8. Question Seven

The item was worded as follows:
Might you use this role-play again with another class?

All teachers expressed a desire to use the package with future classes. Some cautions were made about a necessary characteristic of the class, that they be 'cooperative':

One teacher noted the importance of having the lab available:

> The lab certainly helped. If I had to use a classroom and did this every week and then had to change all the desks around, then that would have been hectic but ... you wouldn't have to do that.

The typical response is well represented by the following remarks:

> I would certainly like to try it again with this particular group. It seems that they are at the age level where any little thing different will take their attention more so than continuing on with their labs and your regular work that you are doing in class all the time.
>
> Yes, I think from now I think it will be a regular thing, especially in grade 7 science. Hopefully, I can figure out other ways to integrate it into the grade 8 and 9 program. I enjoyed it. I am impressed.

5.2.9. Question Eight

The item was worded as follows:
Is this sort of activity useful in other parts of the curriculum?

Several teachers related the role-playing to areas of the curriculum such as social studies, language arts and so on:

> Language program. I am not certain because we are dealing with an environmental issue here, it is certainly useful there. I would have to give it more thought to see if it would fit into any other part of the science program.

One teacher commented on the fine quality of a student's presentation. Noting that the student hadn't spoken out before, he concluded:

> Each year we do a, we have a speakout and every student in the class has to produce a speech and we know that a lot of the kids, probably one-third to one-half, don't do a good job in preparing a speech and that they are uncomfortable speaking in front of the class and this may be an alternative.

Several teachers noted its usefulness for dealing with biological topics like genetics where ethical decisions are increasingly important:

> I think so and especially when you get into the genes factor of it, you know, changing the whole human physical and even the mental ....
>
> You mean other than environment. I can think of some I suppose, i.e. in health or medical aspects of it. I can't think now but there are many I am sure yes.
>
> I was just trying to figure out how you could use it in physical science - you know what I mean. Something that has to do with the physics, I suppose you could use it from a point of view of nuclear energy for instance.... You could also use it for biology, genetics: about genes, is it ethical to be playing around with genes and changing the genes. Of course from the medical point of view, catching diseases before they develop and about changing the whole human being. I can see this class really getting into this kind of thing.
>
> Yes, I think so. There's a couple of projects I can think of now - rocks and minerals - that really lends it[self] well. There [are] other role-plays in the ecology section where you got issues that can be brought out this way, taking care of the environment. There is one section there on air pollution. I think you can do a lot of role-playing there. There [are] a lot of sections in the Grade Seven, Eight and Nine textbooks where this type of thing can be brought into class.
>
> In this particular science we are doing now, I think it can be used in all three grades 7, 8 and 9 on a lot of the topics that you are doing because there are a lot of controversial topics there that you leave people wondering at the end whether the decision being made in the topic is the right one or not and it gives them a chance to express their own views on what they have learned over the last four or five units or whatever.

Several teachers cautioned that the use of role-play should not be overdone, while noting such diverse uses as opening a chapter, sparking research projects or simply providing a change of pace:

> Yes, it is . It is useful occasionally. You wouldn't do it every week.

They do a lot of this in the language program, acting and in grouping and stuff like this, and after a while to be quite honest with you, they become a little bit tired of it, when you tell them to go with your group every week or so, they maybe come a little bit tired. I would say if you could do that once a month or so, or change it a bit according to the topic of course.

I don't know about the higher grades - maybe they get into it a lot more but I don't know if I would feel comfortable in senior high school but I am going to try that in grade 8 too. I have a lot of actors in grade 8.

One teacher remarked on the benefits to the teacher of using the role-play:

Yes - I can see it being useful not just of course in parts of the science curriculum but anywhere across the board; but the thing is that if you are going to teach a scientific concept, you want to see the kids being able to translate it into some kind of practical use that is going to help them when they get older. You can see from the ideas that they presented there today.... That was good to see. Sometimes you wonder when you are teaching them, if what you are doing goes above their head or are they just taking it into one ear and out through the other.

5.2.10. Question Nine

The item was worded as follows:

What are the main advantages/disadvantages of the role-play?

Disadvantages mentioned were few. Several teachers saw potential difficulty getting reluctant children involved, although this was not taken to be an insurmountable problem:

Disadvantages of role-play - students who are very reluctant, very shy, they probably would be very hesitant and they feel left out if they wouldn't take part. I think you can draw them out too. I got to say a positive thing about it - I think you can draw out the more reluctant student.

Others mentioned time constraints:

One disadvantage is to do a really good job you need a couple of back to back periods. My 30 or 35 minute period is not enough for -

maybe I could extend it from one day to another, I think that way it would be okay. The disadvantage is the time, other than that I don't see any real problem.

Teachers sometimes expressed caution about over-using role-playing in response to this question, as they had earlier to Question Eight.

One teacher noted the investment required of the students:

The disadvantages. It is very difficult to find disadvantages once again, probably the only disadvantages, they have to put a little time and effort into it, put themselves into that position and to sort of prepare their role. That is not really a disadvantage. That is probably another advantage if anything because it gives them a chance.

The teachers saw many clearcut advantages to the role-play. Many teachers felt it was a break from the routine:

The main advantage that I see is it takes away from the sort of mundane in-class where you are doing the same thing over and over, lecturing and going to the lab and doing the lab and so on like that. I would recommend something like this be done once every six weeks or so, just to give them a little break, a little time to prepare, start it over a period of a week or two, work in the role-playing as part of your classes and so on like that.

Many teachers stressed the involvement and communication they had seen:

Well some advantages of role-play - it allows them to speak up probably without fear of labeling themselves as having these ideas - it is fun, it can be informative, instructive.

One advantage of role-play is that you get the students involved whereas before well in science labs, I prepared them for their activity. They did their activity, but [there's] very little verbal communication. But this type of activity, you get a tremendous amount of verbal communication. I think that helps students come out of their shell, it helps them become more sociable in the class. That is one tremendous advantage.

One teacher placed their involvement in the larger framework of the social world:

> The main advantages is it lets them see things from the other's point of view because in many situations there first when we asked them, most of them had the point of view was that they would rather see the study and these were all personal points of views as concerned citizens and they didn't want to see the wilderness sort of torn apart. Once they put themselves in other peoples point of view with businesses and the dollars and cents approach sometimes and making money and jobs and so forth like that, they could see it from a different point of view altogether. That is good. In many situations, all types of arguments, you have to put yourself in another person's point view. See their side, this is good that way.

Finally one teacher was impressed, not only with the motivating power of the role-play but also with the interpersonal aspects of the students' involvement:

> I think the advantage is that it creates enthusiasm, where it takes care of the motivation. You are always trying to motivate kids to do something and it is a wonderful motivator for one thing and they get the impression they are doing something themselves and they are doing it with a limited amount of help from you. The amazing thing too about it is how much they helped each other. I saw a kid having trouble with something, instead of running to me, he would go to another student. That certainly is advantageous.

5.2.11. Question Ten

The item was worded as follows:

> What might you advise another teacher interested in trying class role-plays?

Most teachers said they would recommend others to try role-plays. There were many different suggestions to improve the use of role-playing.

The most common response was straightforward support:

> I would encourage him or her to go ahead and do it, certainly and I would be willing to offer my advice and help them and suggest reading your thesis.
>
> Situations like that, I would advise any teacher to save themselves a lot of headaches with motivating and bringing in this and bringing in that and trying to do something else. This could take care of a lot of it. The kids will learn more.

One teacher felt that more background was required:

> Anyone that is going to do role-plays, I think what you got to do first, you got to prepare the class with basic background information concerning the one we did this morning on the gold mine. I think the students should know something about the mining industry, its drawbacks and whatever and I think they should do a little certain amount of material on ecology, background information before they know exactly where to go and look for information to discuss it in the public forum. You got to know what you are looking for if you are going to the library.

Another pointed out the trouble fitting the class within normal time constraints:

> Time-wise. It is a bit of rushed time. We lost five or ten minutes because of change in the classes and we lost another five minutes because of setting up the camera and stuff.

Several teachers mentioned an important alternative to beginning with a full scale role-play:

> Prepare a lot. Do short instead of a whole class, every now and then give a little situation and get them into it that way, slowly and short bit at a time.

Others implied that a push might be needed to introduce other teachers to the idea of role-playing:

> I think other teachers would be interested into it, once they see this and see the tape, I think it is something, like I say, it could be another tool for learning.

This concern was taken further by another teacher, who noted a previous unfavorable attitude:

> Approach it with an open mind. Be willing to try it. I must say I didn't have an open mind about it first. It was suggested in environmental science one time and I couldn't bring myself to do it.... Actually my mind wasn't that open when I came to your workshop, your inservice. But I saw it can be very advantageous.

and a third teacher felt there might be a reluctance to leave the textbook behind:

> The first thing I would advise them is to try it. That is the first

> thing. A lot of people get turned off by these things at the start because it is not in a book, it is not written down, there is no memorization, there is no test type of thing and [students] may not like it. What I would advise is try it.

5.2.12. Question Eleven

The item was worded as follows:

Do you have any comments on the inservice and materials?

This question was an attempt to find out if there were any major problems with the package as it had been developed or presented. The initial confusion over the purpose of the meeting was mentioned by several people:

> Again, I think it put teachers at ease in the sense that we went there wondering what we were going to do and the materials were adequate, giving everyone a role sheet was good, it gave them something to start from.
>
> I couldn't see any problem other than of course not knowing what was going to be covered or what was on the go or what you were going to do.

One teacher wondered if the practice role-play should have been a model of the one used in the study, rather than a small group role-play:

> It would have been [better] if we had divided up into groups half and half, it would have been more like this. You people would have been the moderators, the councillors.

One teacher, who had earlier remarked on his discomfort with the camera, said:

> I think it was well done. It convinced me and I am really looking forward to trying that again in other classes - without a camera.

For most people there were no major problems. As one teacher said:

> It seemed pretty well organized. Everything was there. You had your time allocations and that for anything that went through.... when I came back [to class] everything was terribly well organized, very well organized and just reading through the booklet, everything was outlined what I had to do, what the class had to do that and it

> is hard to improve on that. I felt very positive at the end of it there. You notice at the start [of the workshop] we were all sitting around and everybody was kind of in a daze there but at the end everybody was going over to put down the phone numbers and they wanted you to get into contact with them. Everybody was very positive but the folder that you did up there outlining everything, that was great for me as a teacher in the classroom.

5.3. Analysis of Role-Play Implementation

Teacher use of the role-play strategy was analyzed, and an implementation score devised. The rating scale is included as Appendix I.

The rating scale considers the role-play to have four phases. In the first phase the role-play was introduced. Total possible score was ten. In the second phase roles were chosen. Total possible score was five. The third phase, the actual role-play, was divided into two sections: 3A concerned the debate section and 3B the discussion section. Total possible score was sixteen for each section. The final phase was the debriefing of the students by the teacher. The total score for this phase was seventeen.

A score of sixty-four represented full implementation of the teaching strategy as outlined. Detailed sets of questions guided the judgment of implementation. Videotapes of the role-play were used to count and categorize the ideas that students advanced for their cause, as well as to judge the degree to which they stayed in role. Detailed notes by the author (as classroom observer) were used to decide all other questions of implementation.

The performance scores for each class are reported in Table 5.5 by phase. One teacher is entered three times as he had conducted the role-play with three separate classes.

The scores for the introduction, discussion within role-play and debriefing (phases 1, 3B and 4) all ranged from zero, that is not employed in the role-play, to full or nearly full completion on the criteria used. The debate

Table 5.5 Role-Play Implementation Scores

Teacher	Phase 1	Phase 2	Phase 3A	Phase 3B	Phase 4	Total	% Score
	Max.=10	Max.=5	Max.=16	Max.=16	Max.=17	Max.=64	
1	6	4	15	13	16	54	84
2	1	3	12	10	2	28	44
3	6	4	12	0	0	22	34
4	2	2	12	6	12	34	53
5	2	1	12	10	7	32	50
6	2	5	9	11	14	41	64
7	8	1	15	12	15	51	80
8	1	3	12	0	10	26	46
9	0	4	15	15	0	34	53
10	0	3	12	0	6	21	31
11	8	5	10	6	10	39	61
12	0	5	11	0	7	23	36
13a	5	2	11	11	0	29	45
13b	5	1	11	6	0	23	36
13c	*	*	9	5	0	14	28
14	6	4	11	12	0	33	52

* Phases 1 and 2 of this class were not observed. Percentage score therefore adjusted [Max. = 49].

phase (3A) was most consistent of the four. The debriefing (phase 4) was frequently omitted or extremely brief. When teachers did debrief students the scores were reasonably high. The total scores reflect the divergence of the class experiences, ranging from twenty-two to eighty-four percent. Exactly half the classes were below fifty percent on the implementation score, only two above eighty percent.

Chapter 6
Conclusions and Discussion of Results

The research for this thesis sought to answer several questions on the usefulness of role-play in the science curriculum. A number of different measures were used to answer these questions. Direct observation and reporting by students and teachers show strong positive response. Performance ratings of classes doing role-plays suggests that a wide range of implementation is compatible with a positive response.

Research question one asked if role-play was a useful method for the current Grade Seven curriculum. Judgment of this is based on the student and teacher response as well as rating of the classes' performance of the role-play. The latter is important in showing that the student response and teacher response was to a reasonably similar experience.

The classes were engaged in use of a common teaching model: a role-play exercise. The crucial elements for this particular exercise were that the activity was student-centered, with students expressing both prepared and spontaneous comments in roles while dealing with an environmental science issue. Analysis of class performance of the role-play indicated the presence of these essential aspects despite a wide range on performance scores. Teachers indicated during interviews that they do find the method a useful one for their classes. This was particularly true in terms of student participation and application of science ideas. Student response was similarly positive, demonstrating that there is a match between student and teacher perceptions. Given the great variety of class settings used for the role-play exercise, it is

likely that this result is applicable more generally and that role-playing is a useful method to the curriculum as a whole.

Research question two asked how Grade Seven students would respond to role-playing in relation to their attitudes to science and other teaching methods. Judgment of this is based on the students' responses on two questionnaires they completed.

There were no clear differences among students arising from different attitudes to science. The responses do reveal a clear preference for student-centered instruction as opposed to passive seatwork. Role-play was considered as attractive in this regard as laboratory work, which the students favored highly.

It is interesting that the students did distinguish between liking and learning: while almost uniformly disliking seatwork for instance most students recognized that they learned from it. The presence of this distinction argues for the seriousness with which students answered the questionnaires. The student responses concerning teaching methods support the introduction of role-play. They consistently chose active methods and role-play is a teaching method that actively involves them. Overall, this study suggests that very few students will have a negative response to role-play.

Research question three asked how Junior High science teachers would respond to role-playing in relation to their professional background, attitudes to science and attitudes to other teaching methods. Judgment was based on a questionnaire and an interview.

Teacher response was similar to their students in regard to the usefulness of science. It is not clear that any particular characteristics of teachers make them more likely to use role-play in science class. Some of the participants expressed initial dislike of the idea, others were immediately enthusiastic. A few had previously encountered the teaching method but most

were quite unfamiliar with it. Still others had not considered it as an appropriate method for science teaching (usually considering it as a method for social studies). Despite this wide background, all were ready to employ the method again, after classroom use.

This positive response by teachers appears to contradict the fact that the teaching method is not more widely used. It must be remembered though that only a few teaching methods are commonly used by most teachers. This situation has often been noted (Gallagher, 1986; Mitman, Mergendoller, Packer and Marchman, 1984; Olson and Russell, 1984). In this study teachers did comment on why they have not used role-play. In one instance, a teacher recalled a workshop where it was recommended. He said that he had dismissed the idea as impractical. The present study's workshop videotapes and actual participation had convinced him that it was worthwhile. A persuasive factor for many teachers was the clearly written curriculum plan for using the method. It appears that many teachers cannot find time to attempt building a new curriculum exercise using an unfamiliar technique. This becomes an overwhelming objection when coupled with preconceived notions of how students will respond. Several teachers, for instance, noted their surprise at the clear evidence of independent work and thought their students had shown.

Teacher expectations for student behavior may represent a stumbling block to introducing a student-centered teaching method. The teachers involved had such a variety of positions concerning what behavior was reasonable that a guide to role-play which was overly prescriptive might have been rejected out of hand. Teachers in this study were encouraged to follow their own instincts in conducting the role-play. One, for instance, didn't feel students should move from their regular seats, while another often had students rearrange their seats. Of course this is not merely a teacher characteristic but reflects in part the experience of the teacher with the class, its size and other factors.

Teacher expectations for their own behavior also affected the role-play. Most teachers were clearly reluctant to join in the role-play as a character other than the teacher. Whether this is actually a drawback to the course of the lesson was not demonstrable from the classes observed.

Overall this study suggests that teachers will respond well to role-playing if it is presented in a flexible and approachable manner which demonstrates its usefulness, preferably through videotapes of actual lessons.

This research has opened the door to further research on the potential of role-play as a strategy for enhancing the science-technology-society components of the Junior High science program and improving attitudes towards science at this important level of education.

Results from the study suggest that role-playing for many classes, in various circumstances, will make a pleasant and profitable learning experiences for Grade Seven students. Teachers unfamiliar with the method can confidently employ it in the knowledge that there is little risk of failure. That is, the teachers were satisfied with the progress and outcomes of the classes despite the wide range of implementation scores (Table 5.5) and the large variation in class size and student ability. The method promotes fulfillment of science objectives in both the cognitive and affective domains. Students spontaneously did independent research into ecology for instance, while many commented on their new insights into the importance of ecology in decision-making.

A further lesson from the study is that a program of careful preparation is likely necessary for expansion of teacher repertoire. The videotaped demonstration of the strategy by teachers with regular classes apparently influenced some teachers to participate, as did a clearly written curriculum exercise appropriate to the curriculum. Performance ratings showed a wide range of implementation. This reflects the unfamiliarity of the

method. It would be surprising if teachers simply performed at an immediately high level using a new method. Based on their experience in teacher training, Showers, Joyce and Bennett (1987, p.86) note that: "For a complex model of teaching we estimate that about 25 teaching episodes during which the new strategy is used are necessary before all the conditions of transfer are achieved". Clearly such extensive exposure would not be practical before there was a reasonable assurance that teachers would find the experience profitable. The uniform praise of the teachers for the method as they used it, despite the variation in scores, indicates that the rating scale should be used as a relative rather than an absolute indicator of the method's use. One serious omission was the lack of debriefing at the end of most role-plays. Many ideas were put forward in the typical role-play observed, some much better than others. It is a vital job of the teacher to review at least some of the important points made. Part of the reason for the omission of this section may well have been unfamiliarity with the technique, including a tendency to let the enactment take too long. Any teacher using the technique should be aware of the importance of including a debriefing.

Further work could build on this research by studying year-long use of the technique by a group of teachers. Such an investigation might determine useful aspects of role-play for other areas of the science curriculum and develop new role-play scenarios in response to student interest. Teacher thinking may be a useful guide to in such an investigation to determine the skills necessary for successful use of role-play.

The questionnaires have proven useful for the purpose of examining student attitude. Further testing and factor analysis would be useful to check their reliability and to explore the nature of students' attitudes. Finally, a booklet of role-plays keyed to particular sections of the curriculum should be written and distributed to Grade Seven science teachers as a supplement to the text, in coordination with a workshop on its use.

The study has resulted in a useable curriculum package for the Junior High science program as well as a rating scale for its implementation. It has demonstrated the usefulness of a teaching method uncommon in science classes. The use of this method did not require extensive teacher or student preparation. These conclusions are based on thirty-three classroom periods of observation, seventeen of which were videotaped, involving fourteen teachers. Participating teachers and administrators were found to be uniformly cooperative and inquiring in the pursuit of innovative classroom practice. In the process of the research the opinions of a large number of students were analyzed. These show a positive attitude to science and clear evidence that students have definite thoughts on how they like to learn.

The ultimate goal of this research was to discover the usefulness of a novel, student-centered teaching method to a particular educational milieu. Kelly (1985) praises student-centered activities for promoting many benefits. These include creativity, divergent thinking, exercise of curiosity and exchange of ideas, sharing of control with the teacher, sense of accomplishment, independent research and cooperation. Many of his points are supported by this study. The students were encouraged to be creative, seen in the spontaneity of many role inventions by the students. There was a great deal of divergent thinking expressed by the students in approaching the problems of the environment. There was a free exercise of curiosity and a free exchange of ideas - the latter often commented on by the students. There was a sharing of control by the teacher with the students; Kelly notes: "the fear of surrendering one's authority to chaos is simply unfounded", a point underlined by both teacher and student comments. There was a sense of accomplishment at the conclusion of the role-plays - often by applauding the decision. The students spontaneously went 'beyond the textbook' making use of resources such as local history to independently access appropriate information. Many students worked together very cooperatively, including some who rarely participated in class.

Role-play contributes to learning by providing students with the opportunity to practice skills associated with inquiry, problem-solving and decision-making. It addresses a current theme in the literature of science education - the interaction of science, technology and society. These positive results of the role-play indicate that it can and should be an integral part of the current science program.

Appendix A
Curriculum Package

Contents of the Package

A.1. Introduction

This pamphlet outlines a role-play for science classes.

The Rationale gives background information on the approach used and suggestions for structuring the classes.

The Gold Role-Play supplies the actual class materials. These are: procedures for orienting the student to role-playing (Warmup), statement of the dilemma situation (Introduction), list of the role-players, map of the area concerned, and role-sheets for student distribution.

A.2. Rationale

This material assumes there are four phases to role-play:

1. Warmup and Introduction
2. Role Assignment and Planning
3. Role-Play Enactment
4. Debriefing

These terms and other relevant material are discussed below.

A.2.1. Synopsis

This role-play covers the debate over a potential gold mine involving community members and experts.

A.2.2. Objectives

The students will use science concepts to assess the impact of a mine on a wilderness area. The scientific concepts occur at two levels:

- students will role-play citizens using 'scientific facts'
- students will draw on their school science concepts to debate the merits of a proposed change

The assessment is also multiple:

- The students will assess each others' arguments
- The teacher will assess student use of concepts for discussion (after role-play)

A.2.3. Duration

The role-play is intended to occupy two forty-minute periods in a Grade Seven science class which has been prepared by the explanation, preferably with numerous examples, of basic ecological concepts. The first class will involve warmup, introduction, assignment of roles and handout of role-sheets. This can be done the day before role-play enactment.

A.2.4. Ecologically relevant topics

Pro-mine: Crushed rock for building, wood use, access, catering, housing, general business, construction, more attention from province, spinoff industry...

Pro-study: Bird/animal life, plant life, habitat destruction, pollution of water supply, air pollution, heavy trucks on road, limited life time of mine, tourism, noise pollution...

A.2.5. Organizer's Notes

The text of the role-play is in the form of a brief dilemma or problem situation, to be read out to the students in preparation for the role-play. There are also role sheets for each person or pair. The sheets have been kept brief so that the students may contribute their own ideas. Ideas may also be suggested by the teacher or other students in the warmup and planning stages.

The allocation of roles can be handled in a number of ways. One quick method is to refer to a poster listing the roles and ask students to choose

the character they want. Once the names are chosen, for instance by a show of hands, the students may be broken into discussion groups.

In the first period, after role allocation, it is wise to have students divide into role groups and work on their arguments. The teacher and group members may be used as sounding boards.

The role-play enactment may take the following approach:

1. A brief presentation by each of the role-players. (10-15 minutes)
2. Debate (with players having opportunity to comment on each others' presentations). (5 minutes)
3. The town council votes. (3 minutes)[2]
4. The town council reports their decision. (1 minute)
5. Debriefing. (Rest of period)

A debriefing stage is essential. The purpose is to have students examine their arguments. Were essential ideas used? What was learned? Individual students should not be singled out. The purpose is to examine ideas rather than acting ability. Some students may not wish to be personally linked to the role they played. Therefore it is important to distinguish the role played from the personal opinions of the player[3] . Negative comments should be directed to the role not the individual. There are several ways of distancing the student from the role. Players may be asked to sit with one person who

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[2]While councillors are voting, the presenters may discuss the debate in an informal way in small groups. They may ask if the council gave them a fair hearing and if their roles had good arguments. These informal feelings can be a bridge towards the players stepping out of their roles. This should smooth over any criticism from other players.

[3]In this regard it is worth mentioning that some students get carried away, making accusations about each other's integrity. This can cause bruised feelings. When this has occurred it may be wise to defuse the situation at the beginning of the debriefing. For instance the person who got carried away might be praised for improvising the personality conflict.

agreed with them for a brief discussion. Alternately or additionally the players may be asked how they felt about their roles.

Some suggestions for closure of the discussion:

- Take revote using entire class
- Ask council to explain their votes
- Was situation realistic?
- Was decision realistic?
- Was compromise possible?

A reenactment at a later time may be useful, with the players switching roles. Those who were reluctant to speak first time round may now feel more comfortable. This can lead to further discussion and sharing of experiences. The players may be asked for instance: "Did your own views change because your role did?"

A.2.6. Role-Play and the Role of the Teacher

The teacher is not the central figure in this role-play. This does not mean that the teacher is unimportant or has nothing to do. Much work goes into the preparation and monitoring of a role-play. However the actual role-play should have the teacher in a peripheral role.

The teacher may of course intervene, but should only do so in role. Intervention might occur to prompt someone at an obvious loss or remind the participants about decorum (if the mayor is slow to). A suitable role would be that of a town clerk, who can nudge events but does not directly control them.

Errors of fact or omission and poor arguments should be noted for later discussion and not used to interrupt the role-play.

Let student reaction shape the nature of character choices and

other aspects of the role-play. The warmup should start from the students' perceptions of the dilemma situation, gradually shifting to the focus of the role-play. This stage may provide hints on character choice as well as allowing negotiation over the behavior acceptable in the situation. Behavior will depend on the structure of the class and how students perceive the presented situation. Students should be allowed freedom to the extent that the teacher finds acceptable. However, if the situation is simply dictated without some degree of power-sharing the students are less likely to consider it as an enactment, and therefore less likely to assume roles.

A.2.7. Materials and Equipment Required/Optional

No material besides this brief is needed.

Optional equipment might include props such as microphones, mockups of proposed mine site, overheads and graphs. A map of the area is included as a help. It may be freely modified.

A.2.8. Number of Participants

It is intended that each student be assigned or choose a role although this may be in tandem (especially for children who are otherwise reluctant). In a class of more than about eighteen students, doubling up of roles will be essential (unless new roles are invented).

Try to keep choices from being stereotyped. A number of role assignments are possible for any pupils who don't wish to be presenters: newspaper reporter (holding mikes to speakers etc.), timekeeper (ensuring presenters don't exceed time limits) and so on.

Note that the role names are meant to amuse and relax students while making the role's position obvious. They do not stereotype by gender. Alternate male and female names are suggested for each role.

A.2.0. Physical Setting

A normal classroom setting is suitable with desks arranged to mimic a town meeting.

The role-play itself should be conducted so that the players have a chance to interact in role: there must be a chance for dialogue. Arrangement of tables in two concentric circles with inner circle for role speaker and outer for partner will keep partners close together for support and have the characters facing each other. The partners will be located so as to help quietly.

Alternately and more easily the players can form parallel rows with opposite sides facing each other, mayor and councillors at front of room. Any students who don't have role briefs may feel more involved if they are placed between the opposing sides, in the center of the room, with the mayor facing them.

A.3. Gold Role Play

A.3.1. Role-Play Warmup

The nature of the warmup will vary with the class but its intent is to bring the proposed role-play into the class in terms the students feel comfortable with.

Class can be opened with reference to some local event or general situation, or with a question.

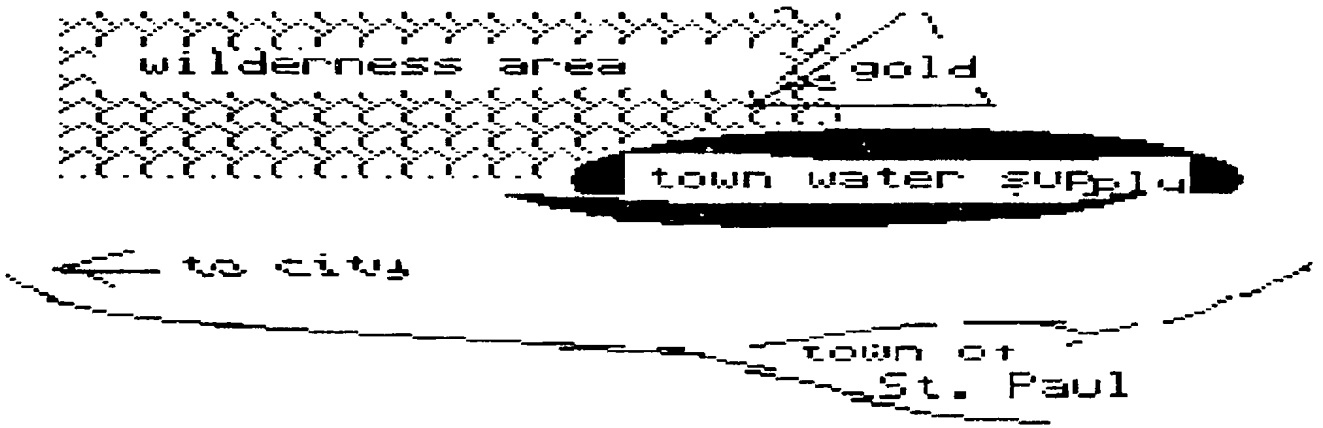
Answers will serve to begin focusing the discussion on the relevant areas, bringing out the variety of views present in the group. It is important that all views be accepted. The students should not feel that one correct or favored view is being sought, although of course some points will be more useful in shaping the discussion than others.

The substance of the eventual role-play will have to be over the necessity of the study. Many will likely say it serves no purpose. The mine may only be delayed by the meeting, not stopped. Try to bring in situations where the student was determined to do something and later regretted doing it because of some hidden aspect of the situation.

As conversation moves begin bridging towards the role-play by asking such questions as:

- Have you ever wanted a change to occur but couldn't cause it?
- Have you ever wondered if your science class could be useful outside of school?
- Who should make decisions? On what evidence? By what procedure?
- Could you convince someone that your ideas or opinions were right? How would you know if you had succeeded?

Final bridging will include the notion of role-play and reading the role-play introduction to the class.



Map of St. Paul Area

A.3.2. Role-play Introduction

To be read to class

Gold has been discovered in the wilderness area near the community of Saint Paul, much like our own home town. A company has proposed to start a mine immediately. This means jobs. Many people are in favor of starting up mine operations right away even though regulations by the provincial government require a study first. Environmental studies try to find out how the environment might be damaged. The area is popular with tourists and local people for its beauty, hunting and other outdoor attractions.

The government has agreed to allow the people of Saint Paul to decide whether the mine can start right away or must wait for the study. The town council has invited representatives of all interested groups to present their views at a meeting.

You are going to be present at that meeting as one of the people listed below [*Note: A poster listing the role-players is useful here*]. You'll be given a fact sheet with some hints and time to prepare for the meeting. You'll be expected to support your arguments with ideas from your science class as well as your general knowledge. You will have one to two minutes to present your views.

After the presentations and a debate there will be a vote, in private, by the town council.

Remember that you will be helping to make an important decision: Will the mine start tomorrow as the company proposes, or will it be postponed while a study is done? The study may result in the mine getting the green light - or possibly getting stopped.

[*Note: At this point, it may be helpful to remind students that they do not have to personally agree with the role they choose*]

A.3.3. Role-players

Pro-Study

- Toni or Tom Touristhome
- Betty or Bobby Birdwatcher
- Len or Lynn Leavitalone
- Wendy or Will Watchdog
- Henry or Hazel Hunter
- Blake or Bonnie House

Pro-Mine

- Edith or Eddy Engineer
- Peter or Polly Promoter
- Cecilia or Cecil Rhodes
- Cal or Carmel Corporation
- Helen or Herbert Killem
- Terri or Terry Lake

Optional Characters - No Role Briefs

- Maggie or Marty Mayor
- Goahead Councillor
- Waitandsee Councillor
- Town Clerk
- Miner
- Wilderness Area Official
- Media and Wildlife Group Representatives
- Recording Operators etc.

Role Briefs

Role Brief

Pro-study Name: Henry or Hazel Hunter

Background: You've lived just outside the wilderness area all your life. You hunt there regularly. You think the roads built by a mine company would give too many people easy access to the area. This could cause overhunting.

The whole situation makes you very upset.

Remember you only have one to two minutes to get your argument across so make it a good one. The space below is for points you might want to make.

Notes

Role Brief

Pro-study Name:Toni or Tom Touristhome

Background: You grew up in St Paul and have a small hotel which caters mostly to the tourists who come to view the wilderness area. You think the business will be hurt by the mine. You've put a lot of work into renovating and enlarging your hotel. It has also put you deeply in debt. You're counting on this year's trade to pay the mortgage. You know that most construction workers will likely be from the area and therefore won't need boardingrooms.

You're deeply worried about the consequences of simply going ahead with the mine - any delay will be good!

Remember you only have one to two minutes to get your argument across so make it a good one. The space below is for points you might want to make.

Notes

Role Brief

Pro-Study Name: Betty or Bobby Birdwatcher

Background: You are a native of St. Paul, and love the outdoors. You know the wilderness area as well as anyone and feel the mine will destroy the habitat of many animals - especially the birds that live in the forest. A lot of people do not appreciate them but you know that several rare species live there. They will be disturbed by the noise and may not be able to reproduce.

Remember you only have one to two minutes to get your argument across so make it a good one. The space below is for points you might want to make.

Notes

Role Brief

Pro-Study Name: Len or Lynn Leavitalone

Background: You're not from St. Paul but the neighboring city. You are worried that the mine will endanger the watershed area, which supplies water to St. Paul and the city. You don't want the people of St. Paul thinking that you're just opposed to their getting jobs. But a study is essential to discover possible danger to everyone's welfare. This is more important than the rivalry between St. Paul and the city.

Remember you only have one to two minutes to get your argument across so make it a good one. The space below is for points you might want to make.

Notes

Role Brief

Pro-Study Name: Wendy or Will Watchdog

Background: Although you're not from the area, you're very concerned about the mine starting without a proper study. You helped set up the environmental legislation requiring impact studies. This took a lot of work on your part and you think it benefitted all members of the province. If St. Paul overrides the legislation then other towns may as well. You think this would lead the way to exploiting the environment and the people.

Some of the people on the other side seem to be taking your side's views too personally.

Remember you only have one to two minutes to get your argument across so make it a good one. The space below is for points you might want to make.

Notes

Role Brief

Pro-Study Name: Blake or Bonnie Howse

Background: You moved to St. Paul last year and commute to work, five miles away. The reason you moved to St. Paul was to avoid the noise and pollution of the city. Now it seems to be chasing you.

Remember you only have one to two minutes to get your argument across so make it a good one. The space below is for points you might want to make.

Notes

Role Brief

Pro-mine Name: Edith or Eddy Engineer

Background: You grew up around St. Paul and now work for the company that wants to build a mine there. You did the studies that showed a mine would be viable. Pursuing the mine means a lot to you because it should improve your position in the company - it might even get you the vice-presidency. You feel the townspeople are doubting your word when they attack the project.

Remember you only have one to two minutes to get your argument across so make it a good one. The space below is for points you might want to make.

Notes

Role Brief

Pro-mine Name: Peter or Polly Promoter

Background: You are the person who got the government to agree to allow the mine to go ahead without a study. You did this for the people of the town who need work and because you hope to see business improve for your hardware store. When people want to delay the mine - and possibly stop it completely - you feel they're attacking your right to a bigger business.

Remember you only have one to two minutes to get your argument across so make it a good one. The space below is for points you might want to make.

Notes

Role Brief

Pro-mine Name: Cecilia or Cecil Rhodes

Background: You are from St. Paul and base your contracting business there. You have talked with the company interested in opening the mine and have a very good chance of being awarded the contract to build the mine roads. This would finance the purchase of badly needed new equipment. Otherwise you don't know if you can keep the operation going.

Remember you only have one to two minutes to get your argument across so make it a good one. The space below is for points you might want to make.

Notes

Role Brief

Pro-mine Name: Cal or Carm Corporation

Background: You own the company interested in starting the mine. You don't want trouble from people worrying about the environment - who knows, it might hurt the company's stock. You grew up in a small town yourself and know how hard it is to get something going. Still, your company could make a lot of money on the gold mine: it is easy to get at and of high grade.

Remember you only have one to two minutes to get your argument across so make it a good one. The space below is for points you might want to make.

Notes

Role Brief

Pro-mine Name: Helen or Herbert Killem

Background:You like to hunt. Unlike H. Hunter you feel the mine would be helpful because it would make the interior of the wilderness area more accessible. This will make the better sites more accessible. Then an accident wouldn't be so serious. As things stand now it would be nearly impossible to get someone out of the area without a helicopter. Also roads would make it easier to fight forest fires. There haven't been many of these recently, but that's just luck.

Remember you only have one to two minutes to get your argument across so make it a good one. The space below is for points you might want to make.

Notes

Role Brief

Pro-mine Name: Terri or Terry Lake

Background: You own a roadside gas station and convenience store between St. Paul and the main highway. The mine has to increase traffic and therefore you're all for it.

You're from the neighboring city and feel the people of St. Paul won't listen to you like they would if you were from the town.

Notes

Role Brief

Name: Marty or Maggie Mayor

Background: As mayor you must ensure that everyone is allowed to speak without interruption - to get a fair hearing. You should tell the speakers when they need to finish and you should keep the question and answer period orderly. Remember you have to carefully listen to what the different people say in order to make a good judgment. You have to make a decision based on the facts presented.

Here's the way things should go:

1. First introduce yourself (as mayor) and explain what the meeting is about.

2. Tell the presenters to begin giving their views, **alternating one speaker from the pro-mine side with one speaker from the pro-study side.**

3. After all the presentations, allow the presenters and council to debate what has been said. You should keep the questions orderly.

4. After the debate you and your councillors will leave the room to vote on which side has convinced you.

5. When you return, tell the group of your decision and the entire group will discuss what was said.

There is a time limit on the presentations of two minutes each.

The time limit for the entire debate, after the presentations, is five minutes.

You and your council have three minutes to decide on the winning group.

The presenters' names:

Pro-mine	**Pro-Study**
E. Engineer	T. Touristhome
P. Promoter	B. Birdwatcher
C. Rhodes	L. Leavitalone
C. Corporation	W. Watchdog
H. Killem	H. Hunter
T.Lake	B. House

The space below is for points you might want to note down.

Notes

Role Brief

Name: Goahead Councillor

Remember you have to carefully listen to what the different people say in order to make a good judgment. Your decision should be based on the facts but you find it hard to believe that there's any good reason to stop men and women going to work tomorrow.

The space below is for points you might want to note down. Remember there will be a chance for the council to interview the people presenting their positions at the meeting. Also you will have to take a private vote with the other councillors on the matter when everyone has presented.

Notes

Role Brief

Name: Waitandsee Councillor

Remember you only have to carefully listen to what the different people say in order to make a good judgment. You have to make a decision based on the facts but you find it hard to believe that jobs are worth the risk of doing permanent damage to the area your family has lived in for a hundred years.

The space below is for points you might want to make. Remember there will be a chance for the council to interview the people presenting their positions at the meeting. Also you will have to take a private vote on the matter with other councillors when everyone has presented.

Notes

Appendix B

Letter to School Board Superintendents and Science Consultants

Superintendents
Science Consultants

We are writing to you to ask whether you would be willing for some teachers of Junior High science to have opportunity to participate in a small research project, concerning the use of role-playing in science class.

The project would be carried out by myself, Dr. Jennifer Dodd, and a graduate student, Mr. Greg Coombes.

The purpose of the project is to investigate student and teacher reaction to role-playing, as it may be used in Grade Seven science classes in connection with concepts learned in the unit on ecology. The actual role-playing will be a mock town council meeting concerning the development of a gold mine.

We would like to identify some teachers who would be willing to attend a short training of approximately two hours, arranged at their convenience, to familiarize them with the method and materials to be used in the project.

The project will require two class periods. The first is for introduction and planning. The second is for performance of the role-play and will be videotaped. In addition, the students will be asked to fill out a questionnaire about their attitudes to science classes and the role-playing activity. The teachers will be asked to complete a similar questionnaire. It is hoped the teachers will be willing to answer a few questions about the activity in a brief interview. These responses from teachers and students will be anonymous.

The videotape of the activity will be used to assess how well the class was able to follow the steps of the role-playing activity as suggested to them, so that improved training and presentation of the activity will result.

The report on this project will not use the names of any participants. While individual responses may be cited to illustrate teacher and student attitudes to the role-playing activity, the study is exploratory in nature and not evaluative.

A permission form for parental approval is included , and an explanatory letter for teachers similar to this letter is available. Copies of the teacher and student questionnaires are available for your information and will form part of the teachers' training information.

We are interested in identifying teachers for this project soon, so that we may organize the training and classroom activities for April-May.

We look forward to your response concerning this matter.

Yours sincerely.

Jennifer Dodd
Assistant Professor

Greg Coombes

Appendix C
Letter to Teachers

To: Grade Seven Science Teachers

I am currently conducting research for a Master's Degree in Curriculum at Memorial. I would like you to take part in this research on teaching techniques. It has the approval of your Superintendent and Science Coordinator.

The purpose of the project is to investigate student and teacher reaction to role-playing for use in Grade Seven science classes in connection with concepts learned in the unit on ecology. The actual role-playing will be a mock town council meeting concerning the development of a gold mine. The role-play will be conducted by the classroom teachers, using curriculum materials prepared for the project.

The project will require two class periods. The first is for introduction and planning. The second is for performance of the role-play and will be videotaped. In addition, the students will be asked to fill out a questionnaire about their attitudes to science classes and the role-playing activity. You will be asked to complete a similar questionnaire. It is hoped you will also be willing to answer a few questions about the activity in a brief interview. These responses from teachers and students will be anonymous.

The videotape of the activity will be used to assess how well the class was able to follow the steps of the role-playing activity as suggested to them, so that improved training and presentation of the activity will result.

The report on this project will not use the names of any participants. While individual responses may be cited to illustrate teacher and student attitudes to the role-playing activity, the study is exploratory in nature and not evaluative.

Should you wish to become involved in the project there will be an afternoon workshop tentatively scheduled for one to three p.m. on _____

If you have any questions about the project I'd be very happy to answer them. I'll be available at any time that's convenient for you. My phone number is listed below and I'll be phoning the school next week.

Thanks very much for your attention on this.

Sincerely,

_____

Greg Coombes

Appendix D
Letter to Parents

Dear Parent:

We are writing to ask if _____ may take part in a small research project in _____ science class. The science teacher and principal are cooperating in this project planned with Memorial University's Faculty of Education.

The students will take part in a thirty-minute videotaped role-play on a topic they have learned about in science class. The students will act out a town council meeting on an environmental science issue.

They will also be asked to fill out two brief questionnaires about their science classes. All answers will be kept anonymous.

The debate and questionnaires will take about one hour.

We would greatly appreciate your consenting to your child's participation by signing below and returning this letter to school. If you have any questions please call at school.

Sincerely,

Jennifer Dodd

Professor of Education, M. U. N.

Greg Coombes

_____

Parent's Signature

Appendix E
First Student Questionnaire

Student Questionnaire, Part 1

Greg Coombes, Memorial University

Directions

This questionnaire will help me find out how you feel about the science classes you have and science in general. Your answers will not be seen by your teacher. In fact, after I have both parts of the questionnaire back, I'll remove this sheet and throw it away. It's the only part with your name on it.

Please answer carefully. There will be a second questionnaire within a week's time.

Thanks for your help.

Name_____

Part A

Each of the questions below expresses a feeling toward science or science class or classes in general. Please rate each statement on the extent to which you agree or disagree.

For each statement you may: strongly agree (SA), agree (A), disagree (D) or strongly disagree (SD).

Circle the letter that shows how you feel.

1. Science is very interesting to me.	SA	A	D	SD
2. I don't like science.	SA	A	D	SD
3. Ordinary people can't do science.	SA	A	D	SD
4. Science is my favorite subject.	SA	A	D	SD
5. Science makes me feel uncomfortable.	SA	A	D	SD
6. I do well in science class.	SA	A	D	SD
7. I like all my classes in school.	SA	A	D	SD
8. Science always gives one correct answer to a problem.	SA	A	D	SD
9. I do well in all my classes in school.	SA	A	D	SD
10. I can't use science in my everyday life.	SA	A	D	SD
11. I *LIKE* science class a lot when teacher talks and gives notes	SA	A	D	SD
12. I *LIKE* science class a lot when teacher and students discuss science	SA	A	D	SD
13. I *LIKE* science class a lot when teacher has a laboratory activity	SA	A	D	SD
14. I *LIKE* science class a lot when teacher has a field trip	SA	A	D	SD
15. I *LIKE* science class a lot when teacher has a demonstration	SA	A	D	SD

16. I *LIKE* science class a lot when teacher gives seatwork SA A D SD

17. I *LEARN* science well when teacher talks and gives notes SA A D SD

18. I *LEARN* science well when teacher and students discuss science SA A D SD

19. I *LEARN* science well when teacher has a laboratory activity SA A D SD

20. I *LEARN* science well when teacher has a field trip SA A D SD

21. I *LEARN* science well when teacher has a demonstration SA A D SD

22. I *LEARN* science well when teacher gives seatwork SA A D SD

Were you undecided about any of the above because sometimes you feel strongly one way and sometimes the other? Circle Yes No

If yes, please state the numbers of those questions here: _____

Finally, if there's anything you'd like to say about your science class or how you like to learn, feel free to comment in the space below:

_____

_____

Thank You

Appendix F
Second Student Questionnaire

Student Questionnaire, Part 2

Greg Coombes, Memorial University

Directions

Now that you've participated in a role-play I would like to find out your reactions to it. This questionnaire is much like the first. I'll remind you that your answers will not be shown to your teacher and that your name will be removed from this part when I have placed it with Part 1.

Please answer carefully. If you'd like I can return in a month or so and tell you how the results turned out.

Thanks very much for all your help.

Name_____

Part A

Each of the questions below expresses a feeling toward science or role-plays. Please rate
each statement on the extent to which you agree or disagree.

For each statement you may: strongly agree (SA), agree (A), disagree (D) or strongly disagree (SD).

Circle the letter that shows your feeling.

1. I enjoyed the role-play.	SA	A	D	SD
2. Ordinary people can't do science.	SA	A	D	SD
3. Science always gives one correct answer to a problem.	SA	A	D	SD
4. I can't use science in my everyday life.	SA	A	D	SD
5. The role-play made a good class	SA	A	D	SD
6. I have taken part in school role-plays before.	SA	A	D	SD
7. I would like to do more role-plays.	SA	A	D	SD
8. I *LIKE* science class a lot when teacher gives role-plays	SA	A	D	SD
9. I *LEARN* science well when teacher gives role-plays	SA	A	D	SD

Were you undecided about any of the above?
because sometimes you feel strongly one way
and sometimes the other? Circle: Yes No

If yes, please list those questions here (numbers only):

_____

Part B

I'm very interested in hearing exactly how you felt about the role-play, in addition to the questions above.

1. What do you feel you learned from doing the role-play?

_____

_____

2. What did you like best about doing the role-play?

_____

_____

3. What did you like least about doing the role-play?

_____

_____

4. Other comments: Is there anything else you'd like to say about the role-play (or your science class in general)?

_____

_____

Thank You

Appendix G
Teacher Questionnaire

Teacher Questionnaire

Directions

This questionnaire will help me find out how you feel about the science classes you teach. Your answers will be completely confidential.

Please answer carefully. I will be grateful for any extended comments you can put on the questionnaire in the appropriate places.

Thanks for your help.

Name_____

Part A

The following personal questions have several options as answers.
Circle the most appropriate answer:

1. Number of years' teaching experience:
   0-4 5-9 10-14 15-19 20-24 25 or more

2. Number of years' experience teaching science:
   0-4 5-9 10-14 15-19 20-24 25 or more

3. What per cent of the week do you spend teaching science?
   less than 20 20-39 40-59 60-79 80-100

4. Your current teaching certificate Grade:
   1 2 3 4 5 6 7

5. Approximate number of University science courses completed:
   0 1-5 6-10 11-15 16-20 21 or more

6. Do you have a science degree? Yes No

Part B

Each of the questions below expresses a feeling toward science or teaching methods. Please rate each statement on the extent to which you agree or disagree.
Of course there is no correct or incorrect answer.

For each statement you may: strongly agree (SA), agree (A), disagree (D) or strongly disagree (SD).

Circle the letters that show your feeling.

1.	Science is very interesting to me.	SA	A	D	SD
2.	I like science.	SA	A	D	SD
3.	Ordinary people can't do science.	SA	A	D	SD
4.	Science is my favorite subject.	SA	A	D	SD
5.	Science makes me feel uncomfortable.	SA	A	D	SD

6. A Teacher should be willing to try a new technique in teaching science, even if it might fail.	SA	A	D	SD
7. It's important that the teacher be at the center of every science class.	SA	A	D	SD
8. Science always gives one correct answer to a problem.	SA	A	D	SD
9. Students learn science best if they are told exactly what they need to know	SA	A	D	SD
10. I can use science in my everyday life.	SA	A	D	SD
11. It's important that a teacher know exactly what is going to happen during a class.	SA	A	D	SD
12. A student who does well in High School science classes often still has a poor idea of what science is about.	SA	A	D	SD

Were you undecided about any of the above because you sometimes felt strongly one way and other times you felt strongly the other way? If so, please list those questions here (numbers only):

_____

Have you used role-plays in your science classes this year? Yes___

No___

Have you ever used role-plays is your science teaching? Yes___

No___

Part C

The Table below lists different ways of teaching science that you may have used this year. There are three columns to fill in:

Column 1: Please rank these methods by how often you have used them in your science class this year. Place a "1" by the method you have used most, a "2" for the next and so on. If you have used three methods, you should have ranked them 1 to 3.

Column 2: Please rank those methods you have used by how well you liked them. The method which you liked best is ranked "1", the method you liked second best is ranked "2" and so on.

Column 3: Please rank those methods you have used by how much you feel the students learned from them. The method you think helps students to learn best is ranked "1" and so on.

Method	*Column* 1 How much you **used**	2 How much you **liked**	3 How much students **learned**
Teacher talks/gives notes	___	___	___
Discussion	___	___	___
Field Trip	___	___	___
Demonstration	___	___	___
Laboratory Activity	___	___	___
Debate	___	___	___
Seatwork	___	___	___
Games (_____name)	___	___	___
Movie/Filmstrip	___	___	___
Role-Play	___	___	___
Other (_____name)	___	___	___

Part D

What is your initial feeling toward role-playing, having participated in this workshop?

_____

_____

In the space below feel free to add additional information pertaining to any of the above questions, or your teaching style in general.

_____

_____

_____

_____

_____

Appendix H
Teacher Interview

Teacher Interview Questions

1. What did you like best about the class?
2. What did you like least about the class?
3. Were you comfortable in your role as town clerk?
4. How well do you think the students enjoyed the role-play?
5. Were you happy with the way they acted in their roles?
6. Did they use any of the ideas they learned in science class?
7. Might you use this role-play again with another class?
8. Is this sort of activity useful in other parts of the science curriculum?
9. What are the main advantages/disadvantages of the role-play?
10. What might you advise another teacher interested in trying class role-plays?
11. Do you have any comments on the inservice and materials?

Appendix I
Role-Play Rating Scale

Rater_____ 1 Start Time_____End_____

Teacher/ID_____/__ 2 Start Time_____End_____

Date of Lesson 1___/___/___ Lesson Time_____

Date of Lesson 2___/___/___ Lesson Time_____

Videotape #_____ Footage_____-_____

Scores

Phase(1)_____/10 Total_____/64

(2)_____/5 % Fidelity_____

(3A)_____/16

(3B)_____/16

(4)_____/17

Phase 1: Introduction/Warmup

1. **Did teacher focus student attention on dilemma?**

   0 1 2

2. **Did teacher evoke a variety of student positions?**

   0 1 2

3. **Did teacher encourage students to express views freely?**

   0 1 2

4. **Did teacher check for understanding of the role play?**

   0 1 2

5. **Did students express a variety of opinions on dilemma?**

   0 1 2

Phase 2: Role Assignment/Planning

1. Did teacher allow students to choose roles?

0 1 2

2. Did teacher ensure students discussed points while in groups?

0 1

3. Did students actively discuss their roles?

0 1 2

Phase 3A: Role-Play - Briefs

1. Did teacher stay in role throughout role-play?

0 1 2 3 4

2. Did students stay in role throughout role-play?

0 1 2 3 4

3. Did students employ a variety of concepts?

0 1 2 3 4

4. Did students employ science concepts?

0 1 2 3 4

Phase 3B: Role-Play - Discussion

1. Did teacher stay in role throughout role-play?

0 1 2 3 4

2. Did students stay in role throughout role-play?

0 1 2 3 4

3. Did students employ a variety of concepts?

0 1 2 3 4

4. Did students employ science concepts?

0 1 2 3 4

Phase 4: Debriefing

1. Did teacher help students review their presentation?

0 1 2 3 4

2. Did teacher avoid discussing role-players?

0 1

3. Did teacher attempt to generalize to other situations?

0 1 2 3 4

4. Did many students comment during discussion?

R

0 1 2 3 4

5. Did students make extended comments (on topic, showing enthusiasm etc.)

0 1 2 3 4

Comments

Appendix J
Role-Play Rating Scale Descriptors

Rating Scale Checklist: Descriptors

Phase 1: Introduction/Warmup

1.Did teacher focus student attention on dilemma? 0=not at all, 1=expressed dilemma, 2=used maps, topical refs etc.

2.Did teacher evoke a variety of student positions? 0=none, 1=1 or 2, 2= greater than or equal to 3, actively exploring positions

3.Did teacher encurage students to express views? 0=not at all, 1=perfunctory, 2=clear attempt to get involvement

4.Did teacher check for understanding of role-play? 0=no, 1=rhetorical statements etc., 2=questioning of several students

5.Did students express opinions on dilemma? 0=no, 1=1-2 comments, 2=students clearly involved with the outcome

Phase 2: Role Assignment/Planning

1.Did teacher allow students to choose roles? 0=roles assigned, 1=volunteers chosen by teacher, 2=some decision-making involving students

2.Did students form groups? 0=no, 1=yes

3.Did students discuss points/roles? 0=no, 1=less than half, 2=more than half

Phase 3A: Role-Play - Briefs

1.Did teacher stay in role throughout presentations? 0=not in role: no reference to own role, obtrusive; 1=not in role: no reference

to own role, obtrusive; 2=perfunctory: simple statement of role, obviously controlling;3=in role; 4=in role, controlling statements in role, negotiation of behavior

2.Did students stay in role throughout presentations? Students use each others' role names, present appropriate arguments etc. The overall score is reached as a rounded average of the individual presentations

3.Did students employ a variety of concepts? non-science concepts: 0=no, 1=1 or 2, 2=3-4, 3= greater than or equal to five, 4= greater than or equal to five with elaboration of more than two

Non-science	Presentation	Comments/Quotes
Civic		
Personal		
Aesthetic		
Economy		
Technology		
Tourism		
Health		
Safety		

4.Did students employ science concepts? science concepts: 0=no, 1=1 or 2, 2=3-4, greater than or equal to 3=5, 4=greater than or equal to 5 with elaboration greater than or equal to 3

Science Concept	Presentation	Comments/Quotes
Environment: Bio		
Behavior		
Habitat/Species Change		
Succession		
Pollution		
Air pollution		
Water pollution		
Noise pollution		
Environment: Earth		
Resource-related		
Science-Methodology		
Objectivity/proof		

Phase 3B: Role-Play - Discussion

1.Did teacher stay in role throughout discussion? 0=not in role: no reference to own role, obtrusive; 1=not in role: no reference to own role, obtrusive; 2=perfunctory: simple statement of role, obviously controlling;3=in role; 4=in role, controlling statements in role, negotiation of behavior

2.Did students stay in role throughout discussion? Students use each others' role names, present appropriate arguments etc. The overall score is reached as a rounded average of the individual presentations

3.Did students employ a variety of concepts? may be same as in pres. non-science concepts: 0=no, 1=1 or 2, 2=3-4, 3=greater than or equal to 5, 4=greater than or equal to 5 with elaboration greater than or equal to 3

Non-science	Discussion	Comments/Quotes
Civic		
Personal		
Aesthetic		
Economy		
Technology		
Tourism		
Health		
Safety		

4.Did students employ science concepts? may be same as in pres. science concepts: 0=no, 1=1 or 2, 2=3-4, 3=greater than or equal to 5, 4=greater than or equal to 5 with elaboration greater than or equal to 3

Science Concept	Discussion	Comments/Quotes
Environment: Bio		
Behavior		
Habitat/Species Change		
Succession		
Pollution		
Air pollution		
Water pollution		

Noise pollution
Environment: Earth
Resource-related
Science-Methodology
Objectivity/proof

Phase 4: Debriefing

1.**Did teacher help students review presentations?** 0=no review, 1=teacher talks about method only, 2=teacher talks, a few students involved (less than or equal to 5), 3=teacher and students review, 4=teacher focuses and maintains students on review of their presentations

2.**Did teacher redirect discussion of individuals?** 0=no, 1=yes, redirecting student discussion of individuals

3.**Did teacher generalize to other situations?** 0=none, 1=any, 2=2, 3=3, 4=3, elaborated with student discussion

4.**Did many students comment during discussion?** 0=no students, 1=few, previous speakers only, 2=several, but previous main speakers only, 3=several, previous and new speakers, 4=general discussion involving large proportion of class

5.**Did students make extended comments?** 0=no comments about topic, 1=only comments are on role-play outcomes such as winning or losing, 2= less than or equal to 5 comments, 3=greater than or equal to 5 comments, 4=greater than or equal to 5 comments with students making extended comments and demonstrating strong interest in the issues raised

Appendix K

Interrater Reliability of Role-Play Rating Scale

Table K.1

Data for Interrater Reliability

Phase	Section	Score							
		Rater A				Rater B			
		Teacher							
		1	2	3	4	1	2	3	4
3A	1	4	2	0	0	4	2	0	0
	2	4	4	4	4	4	4	4	4
	3	4	3	4	3	3	3	4	3
	4	3	3	4	3	3	3	4	3
3B	1	4	2	0	0	4	2	0	0
	2	4	4	4	4	4	4	4	4
	3	2	3	1	1	2	3	2	1
	4	3	3	1	1	3	3	1	1
4	1	4	-	3	3	3	-	3	2
	2	1	-	1	1	1	-	1	1
	3	3	-	0	1	1	-	0	1
	4	4	-	4	2	4	-	4	2
	5	4	-	4	3	4	-	4	2

Calculation for interrater reliability:
Hartmann's Effective Percentage
Agreement, P (from Scott and Hatfield, 1985):

$P = 100 \times A / A + D,$

where A = number of identical units marked by two independent analysts

D = number of units marked by one analyst but not other

$P = 100 \times 46 / 46 + 6 = .88$

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